ミャンマー連邦共和国
鉄道安全性･サービス向上プロジェクト
終了時評価調査報告書

平成 28 年 1 月
（2016 年）

独立行政法人国際協力機構
社会基盤・平和構築部

基盤
JR
16-081

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序　　文

独立行政法人国際協力機構は、2013 年 3 月にミャンマー連邦共和国と締結した討議議事録（R/D）に基づき、ミャンマー国鉄を対象として、2013 年 5 月から技術協力プロジェクト「鉄道安全性・サービス向上プロジェクト」を実施しています。

このたび、本プロジェクトの協力終了前になったことから、プロジェクトの活動の実績、成果を相手国側関係機関と合同で評価・確認するとともに、今後のプロジェクト活動に対する提言及び今後の類似事業の実施にあたっての教訓を導き出すことを目的として、終了時評価調査団を派遣しました。

調査団は、ミャンマー連邦共和国の終了時評価メンバーと合同評価調査団を構成して現地調査を行い、その結果を合同終了時評価報告書として取りまとめました。報告書の内容は、プロジェクト関係者に報告され、目標達成度、成果及び 5 項目評価の内容が確認されるとともに、提言内容は今後取り組む事項として確認されました。

本報告書は、同調査団による終了時評価結果及び協議結果を取りまとめたものであり、今後の協力事業の実施にあたり、広く活用されることを願うものです。

終わりに、本調査にご協力とご支援を頂いた関係者の皆様に対し、心から感謝の意を表します。

平成 28 年 1 月

独立行政法人 国際協力機構

社会基盤・平和構築部長　**中村　明**

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略　語　表

略　語	正式名称	日本語
C/P	Counterpart Personnel	カウンターパート
HQ	Headquarters	本社
JCC	Joint Coordinating Committee	合同調整委員会
JICA	Japan International Cooperation Agency	独立行政法人国際協力機構
MM	Man Month	人月（人 / 月）
M/M	Minutes of Meeting	協議議事録
MR	Myanma Railways	ミャンマー国鉄
OJT	On the Job Training	現場実習
OVI	Objectively Verifiable Indicator	業務指標
PDM	Project Design Matrix	プロジェクト・デザイン・マトリックス
PO	Plan of Operations	業務計画
R/D	Record of Discussions	討議議事録

■為替換算

USD 1 ＝ JPY 120.3

MMK 1 ＝ JPY 0.093

（JICA rate for January, 2016）

終了時評価調査結果要約表

１　案件の概要	
国名：ミャンマー連邦共和国	案件名：鉄道安全性・サービス向上プロジェクト
分野：運輸交通 - 都市交通	援助形態：技術協力プロジェクト
所轄部署：社会基盤・平和構築部 運輸交通・情報通信グループ 第二チーム	協力金額（評価時点）：3 億 8,500 万円
協力期間： 2013 年 5 月～ 2016 年 3 月 （2 年 11 カ月、後半 10 カ月は延長分）	協力相手先機関：鉄道運輸省　ミャンマー国鉄
	日本側協力機関：なし

１－１　協力の背景と概要

ミャンマー連邦共和国（以下、「ミャンマー」と記す）の鉄道網総延長はメーター軌 5,934 km に及び、全線非電化である。そのうち、中央平原を縦断するヤンゴン～マンダレー線（約 620 km）とヤンゴン環状線を中心とした都市鉄道線のみが複線で、残りは単線である。2011 ～ 2012 年度における年間旅客輸送量は 5,380 万人（約 14 万 7,000 人 / 日）であった。すべての路線について、鉄道運輸省下の国営企業であるミャンマー国鉄（Myanma Railways：MR）が建設から運営・維持管理までを一元的に管理している。

近年、鉄道運輸省並びに MR の間で、既存線の補修に対する重要性が認識され始めている。従来は MR の年間予算の大半が新線の建設に使われ、既存の鉄道施設・設備の更新に係る予算割合が少なかった。そのため MR は、どのように安全性を確保し、サービスの低下を克服するかという重大な課題に直面していた。これらの状況がヤンゴン～マンダレー区間の 2011 ～ 2012 年度における年間事故件数 118 件につながっており、その要因は軌道関係 50％、車両関係 29％、その他 21％となっている。

サービスレベルについては、列車の速度や時間の正確性、快適性（乗り心地、客車の清潔度）や運賃等、さまざまな要因への対応が求められる。ヤンゴン～マンダレー間の区間表定速度は時速 39 km と遅く、多くの箇所で速度が制限されている。また、ヤンゴン～マンダレー間の急行列車の過去 3 年間の定時運転率は 41％と低い。さらには、列車の遅れの原因は軌道によるものが 59％、車両関係が 22％となっている。これらから、軌道の劣化が列車の遅れの主な要因となっていることがうかがわれ、それが車両の振動や乗り心地の悪化にもつながっている。

これらの背景から、「１－２　協力内容」に記載する、鉄道安全性・サービス向上プロジェクト（以下、「本プロジェクト」と記す）の計画と実施に至った。

１－２　協力内容

（1）上位目標：ミャンマー国鉄の安全性及びサービスが向上する。

（2）プロジェクト目標：ミャンマー国鉄の安全性及びサービス向上に資する運営・維持管理能力が強化される。

（3）成果（アウトプット）

1）安全性及びサービス向上のための維持管理に係る課題が整理されたうえで、改善計画が策定される。

2）安全性及びサービス向上のための保線措置を通じ技術力が向上する。

（4）投入（プロジェクト開始～ 2016 年 1 月終了時評価時点）

1）日本側

・総投入金額：3 億 8,500 万円

・日本人専門家：延べ 27 名、合計 79 人 / 月（コンサルタント会社負担分の 8.52 人 / 月含）

・本邦研修：合計 33 名

・供与機材：合計 6,200 万円（約 52 万米ドル）

・プロジェクト運営費：31 万 6,000 米ドル（約 3,800 万円）

2）ミャンマー側

・プロジェクト要員：プロジェクト・ディレクター、プロジェクト・マネジャー、並びに延べ 19 名のカウンターパート（Counterpart Personnel：C/P）

・プロジェクト施設：プロジェクト事務所スペースと研修生用の簡易宿泊施設

・プロジェクト運営費：現地の活動に必要な経費を負担（ パイロットサイトでの業務に係る経費や材料、C/P の出張経費等を含む）

２　終了時評価調査団の概要

調査者

担当分野	氏　名	所　属
総括	田中　賢子	JICA 社会基盤・平和構築部 運輸交通・情報通信グループ第二チーム課長
協力企画	田口　裕介	JICA 社会基盤・平和構築部 運輸交通・情報通信グループ第二チーム課員
評価分析	津曲　真樹	有限会社アイエムジー

調査期間：2016 年 1 月 18 日～ 1 月 29 日	評価種類：終了時評価

３　評価結果の概要

３－１　実績の確認

（1）成果の達成状況

「成果 1：安全性及びサービス向上のための維持管理に係る課題が整理されたうえで、改善計画が策定される」に係る指標はそれらすべてが終了時評価時までに満たされていることから、成果 1 は達成された。

「指標 1−1　軌道、車両、信号・通信、運転にかかわる情報収集システムが確立される」に関して、プロジェクト内で技術分野ごとに専門家と C/P を対に組んで情報収集にあたり、2 名の専門家による MR 本社や車両工場 3 カ所の現地調査も 2013 年 8 月から 9 月にかけて実施された。その結果を踏まえ「MR の安全性とサービスレベルの現状」がまとめられた。

「指標 1−2　事故原因の調査と分析に基づいて安全にかかわる事項がリスト化される」に

ついては、2014 年 2 月 10 日～ 2 月 28 日の研修のなかで、事故及びサービス状況の検証・分析方法に係るワークショップを実施し、事故やサービスレベルの低さを示す 25 のトピックを抽出した。

「指標 1−3　サービスにかかわる事項がリスト化される」については、上に記したワークショップの実施に加え、課題を明らかにするための顧客満足度調査を行い、改善すべき対象が具体的に把握された。

「指標 1−4　問題に対応するためのサービスと安全改善計画が策定される」については、プロジェクト関係者の協議の結果として「MR の技術基準と短期、中期、長期鉄道設備改善計画に係る提言報告書（改訂）」が作成された。

「成果 2：安全性及びサービス向上のための保線措置を通じ技術力が向上する」についても、終了時評価（2016 年 1 月実施）の時点で、本成果に基づく活動は指標を上回る形で完了していることから、達成された。

「指標 2−1　おのおのの対策について（30 名の技術職員を想定）技術移転が効果的に行われる」については、ヤンゴン～バゴー間のうち約 20 km を保線の OJT 実施のためのパイロット区間として選定し、2013 年 10 月の終わりから 2014 年 5 月中旬にかけ、30 名から成るグループを対象として包括的な研修を実施した。その後、内容を 1 カ月で完結するものに見直したうえで幅広い職員に対し研修を提供し、最終的には 574 名もの職員に対し研修を行った。

「指標 2−2　緊急軌道維持マニュアルが作成される」に関しては、保線作業のポイントを要約して①安全作業マニュアル、②線路作業マニュアル、③線路検査マニュアルの 3 部構成から成るマニュアルを英語・ミャンマー語で作成した。

「指標 2−3　質・量の両面から適切な資機材が調達される」について、ミャンマーの実情を入念に分析したうえで、質・量の両面から適切な資機材が選定された。

「指標 2−4　鉄道維持その他に係る技術向上のためのセミナー（3 回）、研修（3 回）を通じて C/P が必要な熟達レベルに到達する」に関しては、セミナーを開催した後にパイロット区間で実地作業を行うサイクルが 3 回実施され、実地作業により C/P の技術が必要なレベルに達したことが確認された。

(2) プロジェクト目標の達成見込み

以下に記すように、「プロジェクト目標：ミャンマー国鉄の安全性及びサービス向上に資する運営・維持管理能力が強化される」は指標を満たす形で達成された。

「指標 1　事故原因分析と再発防止策並びにサービスレベル向上のための手段が MR によって確立/実施/継承される」に関しては、2014 年 2 月 10 日～ 28 日の日程で、事故やサービスレベルの低迷の原因を分析して対応策を立てるためのテクニックに MR 職員が親しむための研修プログラムが MR 本社にて実施され、土木作業、信号、軌道、及び運転分野から MR 本社より 19 名の幹部職員の参加を得た。研修は①専門家によって作成された講義テキストを用いての座学、②ワークショップ、③車両の振動測定器の使用に係る実習、の 3 部から構成された。

研修の後、サービス水準に係る改善点を把握するため、顧客の満足度を調べるインタビュー調査も実施された。全般的な満足度は低かったが、満足度の低い項目が具体的に明らかになり、改善計画が策定された。プロジェクトにて作成されたマニュアルは現在、日々

の実務で主に検査官によって活用されていることが、終了時評価の現地インタビューにて確認された。さらに、これらのマニュアルは、彼らが 2 年ごとに受ける更新試験（refresher exam）準備の復習教材としても参照されているとのことであった。このことから、マニュアルが継続的に活用され、MR の組織内において継承されることが期待される。

「指標 2　保線維持管理のための事務・管理能力が向上し、その向上したレベルが MR によって維持される」に関しては、終了時評価の一環としてパイロット区間にて実施した研修修了生とのインタビューにて、プロジェクトが導入した（プロジェクトの提供による資機材を用いての）保線技術と安全に関する業務慣習（指さし確認や安全靴、ヘルメットや安全チョッキ等の安全保護具の使用）が、研修修了生の保線作業のなかに根づいていることが確認された。今後は、研修修了生がミャンマー各地に戻って保線技術と安全に関する業務慣習を広め、MR のエリア全体に浸透することが期待されることから、MR によって事務・管理能力が維持される可能性が高いといえる。

以上より、サービス改善に係るマニュアルが日々の実務において使用され、また保線技術と安全に関する業務慣習が定着し、それらが継続的に維持される見込みであることから、MR の安全性及びサービス向上に資する運営・維持管理能力は強化されたと考えられる。

（3）上位目標の達成見込み

指標の「現在」という言葉は、当初のプロジェクト・デザイン・マトリックス（Project Design Matrix：PDM）から PDM ver.2 に改定された 2013 年を指すと思われる。よって、プロジェクトの完了後、3 ～ 5 年に上位目標が達成される見込みは、2013 年のデータと終了時評価時に最も近い時点でのデータ、という最低 2 つの時点の数値を比較して推定される必要がある。終了時評価団は、これら 3 つの指標について入手可能な最新データの提供を求めたが、終了時評価インタビュー期間にそのようなデータの提供を受けることができなかった。これらのデータがないなかでは、現時点での上位目標（ミャンマー国鉄の安全性及びサービスが向上する）の達成見込みは断定できない。しかしながら、安全性や運行のサービスレベルに係るこれら指標の重要性から、MR によって記録が取られることが強く推奨される。

３－２　評価結果の要約

（1）妥当性：高い

本プロジェクトの妥当性は、①ミャンマー連邦共和国政府の政策との整合性、②同国の鉄道運輸セクターに係る戦略/計画との整合性、③日本の ODA 政策との整合性、④日本の協力が有する経験や技術の比較優位から高いと評価される。

（2）有効性：高い

成果 1 並びに成果 2 を通じて着実な結果を実現しており、設定された指標を満たしてプロジェクト目標を既に達成していることから、本プロジェクトの有効性は高いと評価される。

プロジェクト目標の達成は、ミャンマーに適切な日本製の資機材と、高い技術の専門性のみならず人間味あふれる専門家という、バランスのとれた投入によってもたらされた。

終了時評価のインタビューにて、プロジェクト・ディレクターからは、本プロジェクトで経験したことはMRにとって初めてのことばかりであり、よって結果はすべてプロジェクトによるものであるとの発言があった。

プロジェクトの骨格は、（セミナーでの）座学と（運行に使われていない軌道を使って、また実際のOJT作業を通じての）実務を通して、また（マニュアル等の）ナレッジを蓄積しながら、関連する技術能力を培うために適切に組み立てられていたが、プロジェクトはさらに、MRが別組織から得る支援に助けられた面もある。その一例は、ヤンゴン～マンダレー線用に日本の鉄鋼メーカーからMRにレールの寄付があったことである。この提供は、その設置の際に、プロジェクトによって培われた技術を基盤としたスキルを試す機会となった。

（3）効率性：高い

プロジェクトが結果を導出するにあたっての、投入と成果の関連性を下に記す4つの観点から検討した結果、プロジェクトの効率性は高い。

1）投入と成果の関連性

技術移転の対象内容の範囲や技術要件の種類（すなわち、より機械化された保線作業）はC/Pにとって新しい試みであり、プロジェクトの介在がなければMRが導入することはなかった手法である。そのため、プロジェクトの投入と成果の間には直接の因果関係があったといえる。

2）前提条件の達成

プロジェクトの開始時点で設定された重要な前提条件である「政府のMRに対する支援が、特に財政面にて確保される」は、成果の産出を支える条件として満たされた。

3）日本による投入の適切さ

計画された投入は、プロジェクトの効果的な実施のために確保された。日本人専門家については、細分化された専門ニーズに的確に対処するために、特に保線分野については5名の専門家がそれぞれの専門分野を担当した。延長期間を含むプロジェクトの全体期間（2013年5月～2016年1月）に79人/月の専門家投入が行われた。このうち11％は、プロジェクトの成果と持続性を高めるために、専門家を派遣するコンサルタント企業の提案と申し出によって同企業が負担した。

2015年5月のプロジェクト終了を控えた段階で、保線に係る研修の継続、保線維持外注化に関する講義の実施、橋梁維持に関する研修実施の要望がミャンマー側から寄せられ、プロジェクト期間は2016年3月まで延長された。この延長により、保線に係る研修をミャンマー全国から集められた574名に実施することができ、プロジェクトの提供する保線技術をMR全体に広げるための素地をつくることができた。

MRの現状にかんがみて選ばれたいくつかの資機材については、既に日本では使われなくなっているものがあったことから、それらの調達とミャンマーへの輸入にあたって追加の時間を要し、日本からの機材が到着したのはプロジェクト開始後約半年経ってからであった。終了時評価でのインタビューにて、プロジェクトが導入した日本からの資機材に対するC/Pの必要性や評価に関するコメントは、感謝の言葉とともに、資機材を非常に高く評価するものであった。これらのコメントには、ハンドタイタンパーの使い勝手の良さ

（従来ミャンマーで使用されていた大型機器より扱いやすい）や振動測定器の精度の高さが含まれる。全体として、プロジェクトを通じてそれまで触れたことのなかった資機材を使用する機会を得たことで、C/P は、より機械化された保線作業にそのレベルを一段上げることができた。

本邦研修は、信号や駅の安全ドアなど、日本のシステムの見学を通して目を見張る物事を体験できたと C/P から高く評価された。それらのシステムすべてをすぐにミャンマーに導入できなくとも、いくつかの保線技術は応用させることが可能であり、その点も含めて啓発の機会となった、という発言が終了時評価にてインタビューを受けた本邦研修参加者から聞かれた。

以上、プロジェクト延長により保線技術をミャンマー国全体に広げる見通しができたこと、提供した資機材や本邦研修が C/P の技術向上をもたらしたことから、日本側からの投入は適切であったと考えられる。

4）ミャンマー側による投入の適切さ

ミャンマー側もプロジェクト活動を支えるためのリソースを確保する努力を行った。パイロットサイトでの作業に係る経費やそのための資機材、並びに C/P の旅費を負担している。また、ミャンマー側は研修生の簡易宿泊施設も提供した。これらはプロジェクト活動に過不足ないものであり、ミャンマー側からの投入は適切になされたといえる。

（4）インパクト：中程度

時間軸で最低限 2 つの比較データが入手できないことで、プロジェクトが上位目標達成に向けて順調に歩みを進めているかを終了時評価時点で判断することは不可能である。しかし、プロジェクトの過程で収集された情報や策定された改善計画は、「鉄道中央監視システム及び保安機材整備計画（2013 － 2014）」や「ヤンゴン・マンダレー鉄道整備事業詳細設計調査」等、MR が JICA と実施する他の活動にも資しており、今後もその傾向が見込まれる。このような相乗効果（synergy）は、上位目標の達成に向けて、プロジェクトの結果に正の影響を及ぼすことが期待できる。

MR の職員構造が今後もこれまでと同様の推移であれば、上位目標達成の外部条件として設定された「運営職員が他部署等に大幅に異動しない」「技術職員が他部署等に大幅に異動しない」は、プロジェクト完了後、3 ～ 5 年後に実施される事後評価にてインパクトが計測される際にその条件が満たされていると推測される。

このように、上位目標を達成する見通しを構成する要素の見込みに差異があることから、インパクトは中程度である。

（5）持続性：中程度

プロジェクトが成し遂げたことをその完了後にミャンマー側が維持/拡大するためには、さらなる努力の余地がある。例えば、横断的な部署を設置することで安全性にかかわる課題対応を主流化させる、タイミングを逃さずにプロジェクトの研修修了生が戻った所属先への追加資機材配付を完了させる、プロジェクトが産出した結果を継承するための投資を可能にするために、財務体質が良好かを重視する等である。よって、本プロジェクトによって発現した効果の持続性は中程度である。

1）制度面：高い

2016 年 1 月にミャンマー政府によって国家運輸交通マスタープランとしてその内容が採択された「全国運輸交通プログラム形成準備調査ファイナルレポート（2014 年 9 月）」は、MR が旅客並びに貨物運輸サービスの提供の維持に欠かせない役割を担っていることを認めている。ミャンマーの国家発展のために、MR が市民（旅客サービス）とビジネス（貨物サービス）に連結性（connectivity）をもたらす重要な役割を果たす状況は続くものと考えられることから、制度面からみた持続性は高い。

2）組織面：中程度

現状の組織構造からみた持続性は、中程度と考えられる。

組織に関する追い風要因の 1 つに、2016 年 1 月に新たに承認された鉄道法が挙げられる。新法の制定によって MR はこれまでの規則や規制を見直して新しいものを整備していく必要があり、その際には、プロジェクトが作成したマニュアルや各種文書を参照することができる。このようなコメントが MR の幹部から出されており、プロジェクトが蓄積した経験を MR が活用する意義を見出している、1 つの局面であるといえる。

プロジェクトの結果がより幅広く、組織の全体に持続性として定着するためには、MR の組織構造をレビューして、安全課題について部局を越えて横断的に所掌する部署を置くべきかについて検討の意義があると思われる。今回プロジェクトは主に土木局と活動したが、横断的に安全を所掌する部局をもって組織全体のアジェンダとして主流化していくことは、MR を安全課題により強い組織にするであろう。

3）技術面：中程度

研修修了以降、修了生は全国にある元の職場に戻って習得した技術を運用している。研修生の人数・範囲を拡大したことによって、プロジェクトは 500 名を超える研修修了生を輩出した（2016 年 1 月終了時評価時[1]）。MR の土木技術職員は 4,000 名ほどであることから、プロジェクトは実に保線に従事する従業員の 13％もの技術力向上に影響を与えたことになる。

研修生の人数や範囲が拡大されたことを受けて、プロジェクトは追加資機材を用意した。これらの資機材については、各管区に機材が 1 セットずつ配分されることが重要であることが第 8 回 JCC にて既に同意されている。しかし終了時評価時点で配分は完了していなかった。そのため、プロジェクトが終わる前に、研修を受けた職員がプロジェクトより授かった技術を維持できることを担保する形で、資機材の供与を完了させることが重要である。終了時評価時点では資機材の配分が完了していないことから、技術面からみた持続性は中程度と評価した。

4）財務面：中程度

独占国営企業である MR は、国で唯一の大量輸送機関として赤字を抱えながら運営を続けてきた。この運営方式は今後も続くと思われることから、プロジェクトが生みだした結果を進展させるためにどの程度の資源を MR に注入するかは、組織の判断と決断に委ねられる。本報告書にても複数回記されたように、国家として MR に重要性を付していることから、今後も MR が企業体として存続することに疑問の余地はない。MR は赤字体質では

[1] 2016 年 1 月 29 日に開催された第 9 回 JCC にて、最終的な研修修了生の総数が 574 名であることが確認された。

あるが、国営企業として国から財政的な補填を受けることができ、鉄道の重要度も高いとみなされていることから、現状の財務面からみた持続性は中程度と考えられる。

３－３　効果発現に貢献した要因

（1）計画内容に関すること

現場においては、雨期における突然の雨や、乾期における気温の急上昇などが起こり得るため、本プロジェクトではこのような条件を考慮した計画を作成した。また、駅構内を除いては作業現場へ通じる道路が少なく、多くの場所において機材の運搬や作業現場への移動に通常より長い時間を要するため、それらを見込んだ作業計画を入念に立てた。

（2）実施プロセスに関すること

本プロジェクトを実施するなかで、日本からの機材到着やMRの便宜供与（バラスト、枕木の提供）の遅延が起こった。また、列車の運行がダイヤどおりに行われておらず、作業ダイヤにない機関車の入換等が発生し、作業が計画どおりに進まない場合があった。その際、隣接駅と連絡をとり列車の遅れを確認しながら作業するなど、状況に応じて柔軟に対応した。

３－４　問題点及び問題を惹起した要因

（1）計画内容に関すること

上位目標の達成見込みを判断するにあたり、該当するデータがMR側で取りまとめられていなかったことから、一部指標のデータ提供を受けることができず、達成見込みの判断が困難であった。

（2）実施プロセスに関すること

特になし。

３－５　結論

本プロジェクトは、①ミャンマー政府の国家政策との整合性、②同国の鉄道運輸セクターに係る戦略的な方向性との整合性、③日本のODA政策との整合性、そして④日本の経験や技術の比較優位にかんがみて、妥当性は高い。プロジェクトの完了に先駆けてプロジェクト目標を達成していることから、プロジェクトの有効性は高い。プロジェクトが結果を導出するにあたって、①投入と成果の関連性、②前提条件の達成、③日本による投入の適切さ、並びに④ミャンマー側による投入の適切さ、の観点から判断すると、プロジェクトの効率性は高い。一方で、設定された指標に基づいての上位目標の達成見込みは断定できない、もしくは見通しを構成する要素の見込みに差異があることから、インパクトは中程度である。実施機関が置かれた政策面、組織面、技術面、並びに財務面の総合的な検討に基づくと、本プロジェクトによって発現した効果の持続性は中程度である。

よって終了時評価チームは、プロジェクトがプロジェクト目標を十分に満たす形で成功裏に実施されたことを確認し、2015年4月6日に締結されたM/Mに基づいて完了するという結論に至った。

３－６　提言

（1）プロジェクトの完了までに取り組まれるべきこと

1）各管区へ最低 1 セットずつの資機材供与

研修生の人数や範囲が拡大されたことを受けて、プロジェクトは追加資機材を用意した。これらの資機材については、各管区に機材が 1 セットずつ配分されることが重要であることが第 8 回 JCC にて同意された。しかし終了時評価時点で配分は完了していなかった。そのため、プロジェクトが終わる前に、研修を受けた職員がプロジェクトより授かった技術を維持できることを担保する形で、資機材の供与を完了させることが重要である。

（2）プロジェクトの完了後、3 ～ 5 年後に上位目標を達成するために検討されるべきこと

1）保線に係る研修の定期的な実施

保線に係る技術移転の範囲が拡大されたことから、技術を活用した基本的な保線について、MR の土木職員 4,000 名ほどのうち、約 13％に当たる 574 名を対象に指導を行うことができた。そのため、MR は既に、この技術を全国に広げる素地を有している。これらの技術に係る研修が、MR の現行の研修に組み込まれることが望まれる。

2）安全課題を横断的に所掌する部署の設置

本プロジェクトでは、保線面からの安全性とサービスの向上を主眼に置いた。上位目標の達成は、保線以外の物事も含む、包括的な対応によって支えられる。MR が組織を挙げて安全性の向上に取り組むためには、安全課題について部局を越えて横断的に所掌する部署の設置について検討の意義があると思われる。

3）安全性や運行のサービスレベルに係る指標の記録

上位目標については、最低 2 つの時点の数値を比較しないとその指標が満たされているか判断ができない性質のものをプロジェクトでは導入した（例：2013 年と 2014 年の運行速度）。しかし、終了時評価時点までに、そのようなデータが取りまとめられていなかったことから、終了時評価団は、現時点での上位目標の達成見込みは断定できない、もしくは低いと結論づけざるを得なかった。安全性や運行のサービスレベルに係るこれら指標の重要性にかんがみ、MR によってこれらの記録が取られることが強く推奨される。

３－７　教訓

（1）C/P に最も適した資機材の供与と技術移転計画の作成

それぞれの分野で高度な知識と技術を有する専門家たちが MR の作業環境を精査し、彼らに最も適した資機材と技術移転の内容を選んだ。十分に練られた計画と実施手順を実施機関と専門家が擦り合わせながら進めたことで、しっかりと現地に根づく（solid）技術移転を達成することができた。

（2）日本の先進技術を紹介する本邦研修の実施

プロジェクトを担当した専門家チームは、日本国内の先進技術を用いた鉄道運営を広く C/P に紹介できる資源にアクセスを有していたことから、C/P にとって具体的かつモチベーションの向上に役立つ事例が盛り込まれた本邦研修を実現できた。この経験が実施機関の職員に大きな刺激となったことは疑う余地がなく、その後のプロジェクト活動により活気

を与えた。

(3) 指標データ記録体制のプロジェクト初期からの確立

上位目標について、最低 2 つの時点の数値を比較しないとその指標が満たされているか判断ができない性質のものをプロジェクトでは導入した（例：2013 年と 2014 年の運行速度)。しかし、終了時評価時点までに、そのようなデータが取りまとめられていなかったことから、終了時評価団は、現時点での上位目標の達成見込みは断定できない、もしくは低いと結論づけざるを得なかった。

Summary of Terminal Evaluation

1. Outline of the Project	
Country: Republic of the Union of Myanmar	**Project Title:** The Project on Improvement of Service and Safety of Railway in the Republic of the Union of Myanmar
Issue/Sector: Transportation-Urban Transportation	**Cooperation Scheme:** Technical Cooperation
Division in Charge: Team 2 Transportation and ICT Group, Infrastructure and Peace Building Department	**Total Cost:** 385 million yen
Period of Cooperation: From May 2013 to March 2016 (Two years and 11 months, including 10 months extension)	**Partner Country's Implementing Organization:** Myanma Railways (MR), Ministry of Rail Transportation
	Supporting Organization in Japan: N/A

1-1 Background of the Project

The Republic of the Union of Myanmar has a totally non-electrified meter-gauge railway network spreading as long as 5,934 km. Most of the network is single-tracked, with double-tracked sections limited to (1) the Yangon-Mandalay section (approximately 620km in length) crossing the central plain and (2) urban railway lines centering on the Yangon circular section. The annual number of passengers was 53.8 million (or approximately 147,000 per day) as of fiscal 2012. The MR (Myanma Railways) under the Ministry of Rail Transportation as fully state-owned enterprise centralizes all aspects of its management, from construction, operation, and maintenance.

In recent years, MR and Ministry of Rail Transportation have come to recognize the importance of maintenance/repair of existing lines in reflection of past practices. In the past, MR invested more than half of the budget in the construction of new railway lines, with only a small portion appropriated for the renewal of existing facilities and equipment. As a result, MR has been facing crucial challenges on how to recover the deteriorated safety level and passenger services. Those phenomenon resulted in the occurrence of 118 accidents for 2011/2012 in Yangon-Mandalay section, whose causes are attributable to tracks (50%), rolling stock (29%) and others (21%) respectively.

In relation to the level of service, a number of governing factors are required to be addressed, including train speed, punctuality, comfort (ride comfort, cleanliness in the passenger room) and fare and charge. The scheduled speed between Yangon and Mandalay is as low as 39km/h, with train speed limited at various points. The on-time operation rate of express passenger trains in the same section is as low as 41% for the consecutive three years. Furthermore, 59% of the services were delayed for improper track conditions and 22% by malfunction of rolling stock. This means that train delay is caused mostly by deteriorated tracks that also produce severe train vibration, which degrades vehicle comfort.

Such background led to the planning and implementation of the Project as described in 1.2 Project Overview.

1.2 Project Overview

(1) Overall Goal of the Project:

Service and safety level of Myanma Railways is improved.

(2) Project Purpose:

Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.

(3) Outputs

1) Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.

2) Technical capability is improved through emergency track maintenance to improve the level of service and safety.

(4) Inputs (As of the Terminal Evaluation)

Japanese side:

- Japanese Experts: A cumulative total of 27 Experts (79 M/M, inclusive of 8.52 M/M supported by the dispatch company of the Japanese Experts)
- C/P Training in Japan: A total of 33 C/Ps
- Equipment: Japanese Yen (JPY) 62 million (Approximately USD 0.52 million)
- Operational Expenses: USD 315,739 equivalent (JPY 37,983,400)

Myanmar Side:

- C/Ps: 1 Project Director, 1 Project Manager, MR staff in the cumulative total of 19 personnel
- Facilities: Office space for the Experts, and temporary dormitory facility for the trainees
- Operational Expenses: Necessary operational costs of Project activities including expenses for Pilot Site work and materials, and C/P travel

2. Evaluation Team

Members of Evaluation Team (Japanese side)	[Leader]	Ms. Satoko Tanaka, Team 2, Transportation and ICT Group, Infrastructure and Peace Building Dept., JICA HQ
	[Evaluation Planning]	Mr. Yusuke Taguchi, Team 2, Transportation and ICT Group, Infrastructure and Peace Building Dept., JICA HQ
	[Evaluation Analysis]	Dr. Maki Tsumagari, IMG Inc.

Evaluation Period: January 18th to 29th, 2016 | **Type of Evaluation:** Terminal Evaluation

3. Results of Evaluation

3.1 Confirmation of Results

(1) Achievements of Outputs

All the indicators set for Output 1 (“Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn”) have been met by the time of the Terminal Evaluation and thus Output 1 is achieved.

Regarding “OVI 1-1. System for collecting information of track, rolling stock, signal and communication, and operation is established”, in order to collect relevant information, Project established Counterpart Team consisting of key managerial as well as technical members drawn

from both Japanese and Myanmar side, structured in matching pairs. In addition, two experts visited MR Headquarters and three rolling stock workshops for facts finding in August and September, 2013. Based on these results, "Present Situation of Safety and Service Level of MR" was compiled to guide further process for this Output.

On "OVI 1-2. Safety issues are listed based on the investigation and analysis of cause of accident", Project organized a workshop during the cause and analysis training conducted from February 10 to 28, 2014, where 25 topics relating to accidents and low service levels were selected.

With respect to "OVI 1-3. Service issues are listed", following the cause and analysis training of February 10 to 28, 2014, Project conducted questionnaire survey on customer satisfaction in order to clarify areas and levels of dissatisfaction which should be improved.

Likewise, on "OVI 1-4. Service and safety improvement plan is drawn so as to tackle the issues", after the discussions among the Project concerned people, "Revised Report of Proposal of Recommendation on Technical Standards of MR and Short-, Medium-, and Long-Term Railway Facilities Improvement Plan" was prepared.

All the activities that have been planned under Output 2 ("Technical capability is improved through emergency track maintenance to improve the level of service and safety") have already been conducted by the time of Terminal Evaluation in a way to significantly exceed the indicators set forth, and thus Output 2 is also achieved.

On "OVI 2-1. Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons)", approximately 20km Pilot Section in the 46.5 mile section (74.8km long) between Yangon and Bago on Yangon-Mandalay line was selected for technical transfer, and the Project conducted comprehensive training program for a batch of 30 trainees from the end of October, 2013 to mid-May, 2014. The Project then enlarged the scope of Pilot Section to provide training to more staff, by re-programming the contents and timing to fit into one month program. Finally, the number of the training graduates increased to 574.

In connection with "OVI 2-2. Working manual of emergency track maintenance is prepared", Japanese experts summarized the points of reflection through the whole maintenance work and compiled into a set of three maintenance manuals, (1) Safe Work Manual, (2) Track Work Manual, and (3) Measurement for Track Manual (English and Burmese).

Likewise, "OVI 2-3. Proper equipment and materials are procured both qualitatively and quantitatively", equipment and materials were selected based on careful analysis of the prevailing situations/conditions in Myanmar.

Finally, on "OVI 2-4. Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others", three combined cycles of (1) seminars and (2) training have been conducted. Japanese experts confirmed through actual work on Pilot Section that the trainees had obtained necessary techniques.

(2) Prospect for Achieving the Project Purpose

The Project Purpose ("Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways"), as determined by the indicators, has been met as

stated below:

On "OVI 1. Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR," training program to guide MR staff to familiarize with techniques on cause of accident and low service level analysis and establishment of countermeasures was conducted from February 10 to 28 in 2014 at MR Headquarters ("HQ"), participated by 19 senior staff drawn from track maintenance, civil works, signaling, rolling stock and train operation divisions as well as from MR HQ. The training consisted of three parts: (1) classroom lecture with textbooks prepared by the Experts; (2) workshop, (3) training of vibration measurement of rolling stock. Following the training, in order to find areas for improvement on service level, interview survey to investigate customer satisfaction level of MR passengers was also conducted. Although the result showed its satisfaction level was low in general, areas with low satisfaction level was specifically figured out, and the improvement plan was drawn. On-site interviews of the Terminal Evaluation confirmed that the manuals prepared by the Project are now referenced for day-to-day practices mainly by inspectors. In addition, these manual sets serve as review materials for them to prepare for refresher exams they sit every two years. Judging from this, the manuals are expected to be continuously referenced and inherited in MR.

On "OVI 2. Administrative and managerial capacity of track maintenance is improved, and improved level is kept by MR," the interviews conducted for Terminal Evaluation at the Pilot Section with the Project trainees endorsed that the Project introduced track maintenance techniques (using Project provided equipment) and safety culture (such as conducting visual check for safety, and wearing of safety gears like helmet, safety boots, safety vest) have been rooted into the track maintenance routines of the staff trained. From now on, the graduates of the training will return to their duty stations and disseminate track maintenance techniques and safety culture to all the areas of MR, so that administrative and managerial capacity enhanced by the Project is most likely be maintained by MR.

As mentioned above, the manuals for improving service level are referenced in their daily work, and track maintenance techniques and safety culture have roots in the day-to-day practices. Moreover, they are expected to continuously maintained, so that it can be concluded that administration and maintenance ability was strengthened for the enhancement of service and safety of Myanma Railways.

(3) Prospect for Achieving the Overall Goal

The word "present" in the indicators is assumed to refer to 2013, the year of PDM revision to PDM2. Thus, prospect of achieving the Overall Goal within three to five years after the completion of the Project must be determined based on the comparison of the corresponding figures of two time horizons at the minimum, the data of 2013 and the latest available at the time of Terminal Evaluation. Although the Terminal Evaluation Team requested the latest available data for these three indicators, such data has not been provided during the Terminal Evaluation interview. Without the availability of such dataset, the prospect of achieving the Overall Goal cannot be determined at

this stage. Nevertheless, given importance of these three indicators to measure safety/ service level of the operation, it is strongly recommended that MR keeps these records available.

3.2 Summary of Evaluation Results

(1) Relevance: **High**

The relevance of the Project is evaluated as high based on its close alignment with (1) the Government policy of the Republic of the Union of Myanmar, (2) strategic plan/direction of Myanmar's rail transport sector, (3) the Japan's ODA Policy, and (4) comparative empirical and technological advantage of Japan's cooperation.

(2) Effectiveness: **High**

The effectiveness of the Project is assessed as high, for having already met the Project Purpose as per the determined indicators based on solid results that were materialized through Output 1 and Output 2.

The achievement of the Project was derived by a balanced combination of Japanese equipment and machinery selected for applicability for the technology transfer to Myanmar and the high technical expertise of the Japanese Experts who also possess compassionate characters. As Project Director noted in the Terminal Evaluation interview, this Project has been one of the kind MR had never experienced, and thus the results are directly attributable to the Project.

While the Project framework was well structured to develop associated technical skills through both theoretical (in seminars) and practical (both at non-operating track and actual OJT work) along with compilation of knowledge products (such as manuals), additionally, the Project benefited from support of other parties. One such example is a donation of rails by a Japanese steel manufacturer to MR installed on Yangon - Mandalay Line. It provided the Project an opportunity to check their strengthened, more technology oriented skills built through the Project.

(3) Efficiency: **High**

The Efficiency of the Project is evaluated as high in view of the four dimensions of Input-Output relationships that the Project managed for results.

1) Causality of Inputs and Outputs

The scope and the type of technical transfer (i.e. on mechanized track maintenance) was new to the C/P, and without the Project it would not have been introduced to MR. For that matter, there was direct cause and effect relationship between Project inputs and outputs.

2) Achievements of Prerequisites

The important assumption set for the Project at the launch that is "The Government support to the MR, especially financial support is secured," held to support the Outputs to be produced.

3) Appropriateness of Inputs by Japan

The planned input was procured to support effective implementation of the Project. Regarding Japanese Experts, in order to address very specific expertise sought, particularly in the area of track maintenance, five Experts were assigned to respectively cover their specialty areas. For

the whole duration of the Project period including follow-up period, a total of 79 M/M Experts' time was allocated to this Project (from May 2013 to January 2016). Eleven percent of this M/M was shouldered by the dispatching company of the Expert Team as the company's own proposal/ initiative in order to enhance the project effectiveness and sustainability.

On May 2015, before finishing the Project, MR requested continuation of the training on track maintenance, lecture series on outsourcing track maintenance, and seminar and training course series on bridge maintenance, the Project was extended to March 2016. This extension led the Project to provide the training to 574 staffs who were gathered from all over Myanmar, contributed to forming the base of disseminating track maintenance techniques to all over Myanmar.

With regard to some of the equipment and machinery selected for the suitability for MR were no longer readily available in the Japanese market, procurement of those items required additional time to import into the country. Those items reached Myanmar about half a year after the beginning of the Project. The necessity for those items and evaluation of the Project introduced Japanese equipment were extremely high, with appreciation among C/P expressed at the time of Terminal Evaluation interviews. These comments included practicality of hand tie tampers (so much easier to handle than the huge machines traditionally used in Myanmar) and precision of vibration measuring equipment. All in all, exposure to new type of equipment through the Project put the work of C/P a level higher toward more mechanized maintenance operation.

Training in Japan was also highly valued by C/P as an eye-opening experience to see some of the Japanese system, such as signaling and safety door at stations. While not all the system can be readily introduced to Myanmar, some track technologies are applicable and thus it was enlightening, was the word of one training participant interviewed for Terminal Evaluation.

As mentioned above, the extension of the Project yielded the prospects for disseminating track maintenance techniques to all over Myanmar, and the equipment and machinery and training in Japan improved techniques of C/P. Judging from them, inputs by the Japanese side were considered as appropriate.

4) Appropriateness of Inputs by the Myanmar side

Myanmar side also made the effort in securing resources to support the Project activities. It included expenses for Pilot Site work, materials and C/P travel. Also, Myanmar side provided temporary housing facility for the trainees. It can be concluded that these inputs have been appropriate just enough for the Project activities.

(4) Impact: **Fair**

Unavailability of comparator data set over a minimum of two time points by the time of Terminal Evaluation makes assessment on whether the Project is on a course to achieve the Overall Goal impossible at this stage.

However, information collected through and the improvement plan designed by the Project have and are expected to continue to aid the other activities MR has been and will be conducting with JICA, such as "The Project for Installation of Operation Control Center System (2013-2014)" and "Detailed Design Study for Yangon - Mandalay Railway Improvement Project." Such synergy is

expected to positively affect the results of Project achievement toward meeting the Overall Goal.

If MR continues to move on a similar trajectory with regard to their staffing composition, the important assumptions set for the Overall Goal, that are "Administration staff members are not relocated drastically," and "Technical staff members are not relocated drastically" are anticipated to hold through the time till the impact is measured at Ex-Post Evaluation, i.e. three to five years after the Project completion.

Given the prospect for achieving the Overall Goal entails mixed potential, impact is assessed as **fair.**

(5) Sustainability: **Fair**

For the achievement of the Project to be maintained and/or further expanded by the Myanmar side after the Project period, there is room for efforts, such as mainstreaming safety agenda within MR by setting up a cross-cutting unit, timely completion of additional equipment distribution to duty stations of the Project participated trainees, and attention to financial soundness to enable investment in succeeding Project produced results. Thus, sustainability of the Project achievements is assessed as fair.

1) Institutional Aspect: **High**

"The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted in January 2016 by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services. For the connectivity MR provides both for citizens (passenger service) and business (freight service) for the country's national development, priority entrusted on to MR is expected to continue. It can be concluded that sustainability from the viewpoint of institutional aspect is high.

2) Organizational Aspect: **Fair**

Sustainability judged from the present organizational structure is fair.

One positive push factor for the organization is the recent enactment of New Railway Act (January 2016). It will require MR to review and furnish new rules and regulations, and the Project prepared manuals and documents can provide good starting references, according to the comment of MR Manager. This is one area where MR can be motivated to bring forward experiences they accumulated with the Project.

To ensure the results of the Project to be institutionalized more broadly on its sustainability, review of organizational structure of MR to see if housing a unit that will oversee safety issues across divisions might merit consideration. This time the Project worked with Civil Division mainly, but going forward, mainstreaming safety as an organizational agenda with a cross-cutting unit will make MR a more effective organization on safety concerns.

3) Technical Aspect: **Fair**

The graduates of the training have since returned to their duty stations throughout the country to apply obtained techniques. The enlarged scope of track maintenance training led the Project to provide the training to over 500 (by the time of the Terminal Evaluation in January 2016). Given

the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance.

Project arranged additional equipment for the increased scope and coverage of the trainees. On these additional equipment, at the 8th Joint Coordinating Committee ("JCC") meeting, it was agreed that allocation of one set to each division is important. At the time of Terminal Evaluation, however, the allocation has not been completed. Thus, it will be important for the Project to complete the equipment allocation before its closure in a way so that the Project trained staff can continue with the technology they have acquired from the Project. Considering that equipment allocation hasn't been completed yet at this stage, sustainability by technical aspect is evaluated as fair.

4) Financial Aspect: **Fair**

As a monopolized state-owned transport enterprise, MR has maintained its operation under deficit as the sole critical mass transit mode for the country. This operation mode is considered to continue in the coming years, and it will be an institutional judgement and decision as to how much/less to resource the organization for carrying forward the results produced by the Project. However, as discussed multiple times in this report, national importance is attached to MR, and thus, its status as on-going concern is not doubted. Because MR is a loss-making enterprise but can receive financial support from the government as an important state-owned enterprise, sustainability with respect to current financial aspect is fair.

3.3 Factors enabling the realization of positive effects

(1) Factors concerning planning

The Project crafted a working plan taking into consideration on-site conditions, such as a sudden rain during rainy season and temperature rise during dry season. Moreover, as there are few roads connecting with working sites except inside stations, it takes more time to carry equipment and move to working sites in many places than usual. The working plan was carefully made in consideration for these conditions as well.

(2) Factors concerning implementation process

During implementation, equipment from Japan and duties by Myanmar side (provision of ballast and sleepers) were delayed. In addition, due to the trains which are not operated on time and the changes of locomotives which are not displayed on the timetable, things didn't always go as designed. In these cases, the Project dealt with them flexibly depending on the situations, such as checking up train delays by contacting the neighboring stations.

3.4 Factors obstructing the realization of positive effects

(1) Factors concerning planning

Judging the prospects of meeting Overall Goal, figures for indicators have not been compiled by MR side by the time of Terminal Evaluation. Evaluation Team didn't receive parts of indicator data and had difficulties in determining the prospects of achieving.

(2) Factors concerning implementation process

None.

3.5 Conclusions

The relevance of the Project is evaluated as high based on its close alignment with (1) the Government policy of the Republic of the Union of Myanmar, (2) the strategic direction of the country's rail transport sector, (3) the Japan's ODA Policy, and (4) comparative empirical and technological advantage of Japan's cooperation. The effectiveness of the Project is assessed as high, for the achievement of Project Purpose before the completion of the Project. The efficiency of the Project is evaluated as high in view of the four dimensions of input-output relationships that the Project managed for results: (1) causality of inputs and outputs; (2) achievements of outputs; (3) appropriateness of inputs by Japan; and (4) appropriateness of inputs by Myanmar. On the other hand, the prospect for achieving the Overall Goal against the preset indicators cannot be determined, and the factors relevant to the prospects are variable, which in turn warrant a rating of fair for the Project impact. Project sustainability is also considered fair, based on a comprehensive assessment of the implementing agency's current institutional, organizational, technical, and financial aspects.

Terminal Evaluation Team thus confirmed successful implementation of the Project with full achievement of the Project Purpose and reached a conclusion that the Project be completed in March 2016 as per signed M/M of April 6, 2015.

3.6 Recommendations

(1) To be Responded by the Completion of the Project

1) Allocation of at least one set of equipment to each division

Project arranged additional equipment for the increased scope and coverage of the trainees. On these additional equipment, at the 8th JCC meeting, it was agreed that allocation of one set to each division is important. At the time of Terminal Evaluation, however, the allocation has not been completed. Thus, it will be important for the Project to complete the equipment allocation before its closure in a way so that the Project trained staff can continue with the technology they have acquired from the Project.

(2) To be Considered for Successful Achievement of the Overall Goal in Three to Five Years After the Project Completion

1) Periodic training for track maintenance

By the enlarged scope of track maintenance technology transfer, the Project could manage basic track maintenance using technology to about 13% of the total civil staffs (574 staffs out of approx. 4,000) at MR. Now MR has a sufficient foundation to mainstream new practices nationwide. It is hoped that training for such techniques will be incorporated into existing training conducted by MR.

2) Establishment of a cross-cutting safety unit

In this Project, the focus was placed on safety and service improvement through track

maintenance. Achievement of the Overall Goal will be supported by comprehensive measures beyond track maintenance. In order for MR to tackle safety improvement issues organization wide, establishment of a cross-cutting safety unit to more broadly oversee safety matters merits consideration.

3) Keeping records regarding safety/service level of the operation

For Overall Goal, the Project used indicators that require at least two comparative figures from different time points for judgement (e.g. operating speed in 2013 and 2015). However, since baseline and present figures have not been compiled by the time of Terminal Evaluation, Evaluation Team had to conclude that the prospect of meeting Overall Goal cannot be determined or low. Nevertheless, given importance of these three indicators to measure safety/ service level of the operation, it is strongly recommended that MR keeps these records available.

3.7 Lessons Learned

(1) Equipment and technical transfer arrangement which are the most suitable for C/P

Experts with highly advanced knowledge and technology in the given field carefully examined the working environment of MR, and selected appropriate equipment and technology transfer arrangement. Carefully crafted plans and implementation procedure by the joint effort of the implementing agency and the Experts secured solid technology transfer achievement.

(2) Implementation of C/P training in Japan to introduce state-of-the-art technologies

Because the Project was managed by a team of Experts with full access to technically advanced train service operation in Japan, C/P training in Japan could be organized to entail aspects/cases that are concrete as well as motivational for them. This experience has positively affected the staff of the implementing agency, and made the subsequent Project activities more vibrant.

(3) Establishment of a system for keeping figures for indicators from the early stage of the Project

For Overall Goal, the Project used indicators that require at least two comparative figures from different time points for judgement (e.g. operating speed in 2013 and 2015). However, since baseline and present figures have not been compiled by the time of Terminal Evaluation, Evaluation Team had to conclude that the prospect of meeting Overall Goal cannot be determined or low.

第１章　終了時評価調査の概要

１－１　終了時評価の背景と目的

１－１－１　終了時評価の背景

ミャンマー連邦共和国（以下、「ミャンマー」と記す）「鉄道安全性・サービス向上プロジェクト」（以下、「本プロジェクト」と記す）は、運営・維持管理能力の向上を通じてミャンマー国鉄の安全性とサービスを高めることを目的とする技術協力である。

ミャンマー政府の要請を受けて独立行政法人国際協力機構（JICA）が 2012 年 10 月に詳細計画策定調査を実施し、協力のフレームワークについてミャンマー政府と合意し、2013 年 3 月 28 日にその内容を示した討議議事録（Record of Discussions：R/D）の署名交換を行った。同 R/D に基づき、2013 年 5 月にミャンマー国鉄（Myanma Railways：MR）を実施機関とするプロジェクトが開始された。

プロジェクトの終了を 2015 年 5 月に控えた段階で、ミャンマー政府よりプロジェクト延長の打診が寄せられた。延長の目的は、その時点までにプロジェクトが築き上げた成果を MR の近代化に十分に役立てるために、以下の活動をプロジェクトに加えたい、というものであった。

①ヤンゴン～マンダレー線を対象とする保線維持に係る研修について、ティラワ線も対象に含めたうえで継続する

②保線維持を外注化する手続きについて、日本の経験に基づいての講義を実施する

③橋梁維持に関する講義を実施する

2015 年 4 月 6 日に締結された協議議事録（Minutes of Meeting：M/M）に則ってこれらの活動はミャンマー政府及び JICA より承認され、プロジェクトの現行のフレームワークのなかで行われることとなり、プロジェクト期間は 2016 年 3 月まで延長された。

上記 R/D 並びに延長のために締結された M/M に基づいて、2016 年 3 月まで延長されたプロジェクトの終了を控え、プロジェクト活動の実績、成果を評価、確認するとともに、今後の類似事業の実施にあたっての教訓を導くことを目的として、両国の代表者からなる合同終了時評価調査団（以下、「調査団」と記す）により終了時評価が実施された。

１－１－２　終了時評価の目的

終了時評価調査の目的は、以下のとおりである。

(1) 終了時評価用プロジェクト・デザイン・マトリックス（PDMe）（「付属資料５．プロジェクト・デザイン・マトリックス（PDMe）」を参照）に基づいて、投入と成果の達成度、プロジェクト期間終了までのプロジェクト目標達成見込みとプロジェクト終了後 3 ～ 5 年での上位目標達成見込みを確認する。

(2) プロジェクト活動実施における貢献要因と阻害要因を検証する。

(3) 評価 5 項目（妥当性、有効性、効率性、インパクト、持続性）の視点から総合的な評価を実施する（「２－２　評価の基準」を参照）。

(4) プロジェクトのさらなる改善に向けた提言を導出し、同様の JICA プロジェクトで参考となる教訓を明らかにする。

(5) プロジェクトの方向性を協議・合意し、協議の結果に基づいて、終了時評価調査報告書を

作成する。

１－１－３　終了時評価調査団員と調査日程

(1) 終了時評価調査団員

1) 日本側

担当分野	氏　名	所　属
総括	田中　賢子	JICA 社会基盤・平和構築部 運輸交通・情報通信グループ 第二チーム課長
協力企画	田口　裕介	JICA 社会基盤・平和構築部 運輸交通・情報通信グループ 第二チーム課員
評価分析	津曲　真樹	有限会社アイエムジー

2) ミャンマー側

担当分野	氏　名	所　属
Project Director	Mr. Aung Win	General Manager (Technical & Admin), Myanma Railways
Project Manager	Mr. Tin Soe	General Manager (Civil), Myanma Railways
Deputy Project Manager	Mr. Maung Maung Thwin	Deputy General Manager (Civil), Myanma Railways

(2) 終了時評価調査日程

終了時評価調査は 2016 年 1 月 18 日から 29 日の期間で実施された(「付属資料１．調査日程」を参照)。

１－２　プロジェクトの概要

１－２－１　プロジェクトの背景

ミャンマーの鉄道網総延長はメーター軌 5,934 km に及び、全線非電化である。そのうち、中央平原を縦断するヤンゴン～マンダレー線（約 620 km）とヤンゴン環状線を中心とした都市鉄道線のみが複線で、残りは単線である。2011 ～ 2012 年度における年間旅客輸送量は 5,380 万人（約 14 万 7,000 人 / 日）であった。すべての路線について、鉄道運輸省下の国営企業である MR が建設から運営・維持管理までを一元的に管理している。

近年、鉄道運輸省並びに MR の間で、既存線の補修に対する重要性が認識され始めている。従来は MR の年間予算の大半が新線の建設に使われ、既存の鉄道施設・設備の更新に係る予算割合が少なかった。そのため MR は、どのように安全性を確保し、サービスの低下を克服するかという重大な課題に直面していた。これらの状況がヤンゴン～マンダレー区間の 2011 ～ 2012 年度における年間事故件数 118 件につながっており、その要因は軌道関係 50％、車両関係 29％、その他 21％となっている。

サービスレベルについては、列車の速度や時間の正確性、快適性（乗り心地、客車の清潔度）や

運賃等、さまざまな要因への対応が求められる。ヤンゴン～マンダレー間の区間表定速度は時速39 km と遅く、多くの箇所で速度が制限されている。また、ヤンゴン～マンダレー間の急行列車の過去 3 年間の定時運転率は 41％と低い。さらには、列車の遅れの原因は軌道によるものが 59％、車両関係が 22％となっている。これらから、軌道の劣化が列車の遅れの主な要因となっていることがうかがわれ、それが車両の振動にもつながっている。

これらの背景が、「１－１－１　終了時評価の背景」にて記載された本プロジェクトの計画と実施につながった。

１－２－２　プロジェクトの要約

上　位　目　標	ミャンマー国鉄の安全性及びサービスが向上する。
プロジェクト目標	ミャンマー国鉄の安全性及びサービス向上に資する運営・維持管理能力が強化される。
成　　果	(1) 安全性及びサービス向上のための維持管理に係る課題が整理されたうえで、改善計画が策定される。 (2) 安全性及びサービス向上のための保線措置を通じ技術力が向上する。
実　施　期　間	2013 年 5 月～ 2016 年 3 月（2 年 11 カ月）
実　施　機　関	鉄道運輸省　ミャンマー国鉄

１－２－３　プロジェクト・デザイン・マトリックス（PDM）の変更

R/D（2013 年 3 月 28 日締結）に添付された当初 PDM から、プロジェクトの実績を最も効果的かつ効率的に把握できるための PDM とするために、2 回のレビューが行われた。

(1) 当初 PDM（PDM ver.1）から修正 PDM（PDM ver.2）への変更について

R/D（2013 年 3 月 28 日締結）に添付された当初 PDM からの最初の修正は、インセプションレポート提出時（2013 年 8 月）に行われた。上位目標に関しては、以下に記すように、採択された指標の数値化はプロジェクトが置かれた状況にかんがみて難しいことから、修正に至った。

1）年間事故件数

①パイロット区間は 20 km と短く、よって軌道修復作業を実施する区間が限られる、②ヤンゴン～マンダレー線間にある各種鉄道設備の修復・近代化の展望が明確ではないため、鉄道設備の劣化が要因となる事故をどの程度減少させることができるかが不確かである、③事故件数は主に気候等の影響で年度ごとに大きく変化するため、減少率を絶対数で測る指標は避けられるべきである。

2）速度制限箇所の数の減少、運行速度の増速、定時性の向上

信号システムの近代化なしには列車運行の安全を確保しながらの増速は難しいかもしれず、よって、「速度制限箇所数の減少」「速度の向上」「列車運行の定時性の向上」が採択され、数値による説明は削除された。

プロジェクト目標については指標が明確となり、かつ特定されるよう語彙の整理が行われた。

PDM 修正の概要

要　約	指　標		
	PDM ver.1	PDM ver.2	PDMe
	R/D 締結時 （2013 年 3 月）	インセプションレポート時 （2013 年 8 月）	終了時評価時 （2016 年 1 月）
上位目標			
ミャンマー国鉄の安全性及びサービスが向上する	①ヤンゴン～マンダレー間の年間事故件数が、2011 ～ 2012 年の 118 件から減少する	①ヤンゴン～マンダレー間の年間事故件数が現在並びに過去の記録に比して減少する	［変更なし］
	②ヤンゴン～マンダレー間の平均制限速度が 2011/2012 年度平均より 10％増加する（2011/2012 年度の実績値は後日設定されること）	②ヤンゴン～マンダレー線の速度制限箇所数が現在よりも減少する	［削除］
		③ヤンゴン～マンダレー線の速度が現在に比して増速される	［変更なし］
		④現状よりヤンゴン～マンダレー線の急行のスケジュールが厳守される	［変更なし］
	③顧客満足度が向上する	⑤顧客満足度が向上する	［削除］
		⑥乗客数	［削除］
プロジェクト目標			
ミャンマー国鉄の安全性及びサービス向上に資する運営・維持管理能力が強化される	①管理運営に必要な資機材が提供される	①事故原因分析と再発防止策並びにサービスレベル向上のための手段が MR によって確立 / 実施 / 継承される	［変更なし］
	②（少なくとも 1 名の）責任者と（少なくとも 5 名の）実務に携わる職員の管理能力が高まる	②保線維持管理のための事務・管理能力が向上し、その向上したレベルが MR によって維持される	［変更なし］

（2）修正 PDM（PDM ver.2）から終了時評価 PDM（PDMe）への変更について

終了時評価の協議のなかで、上位目標に係る指標の簡素化が提案された。その背景は、同指標は実施機関がプロジェクト終了 3 ～ 5 年後の達成を想定してモニターするものであり、その途上でのデータ蓄積に過剰の努力を要するべきではないためである。それよりも、通常の列車運行サービスの一環として蓄積されるデータが使用できることが望ましいというものであった。このような考えを基に、プロジェクトの主な焦点であるサービスと安全性の 2 つの側面の計測という要件を充足させる観点から、「事故件数（対安全性）」「速度（対安全性とサービスの両方）」「定時制（対サービス）」に係る指標に絞り、それ以外の速度指標 2 指標と、乗客数については削除することとなった。特に後者については、顧客がアクセスを有する他の交通機関の傾向との比較等をせずに指標値がもつ意味を確定できないことから、その有効性が疑問視されたためである。

第２章　終了時評価調査の方法

２－１　終了時評価の概要

本終了時評価調査は「新 JICA 事業評価ガイドライン　第 1 版（2010 年）」に基づき、以下の手順で実施された。

ステップ 1：評価設問並びに評価に必要なデータや情報を整理した評価グリッドを作成する
ステップ 2：評価に必要なデータ並びに情報を収集する
ステップ 3：PDMe に基づいて、プロジェクトの実績（投入の実績、活動の実績、成果の達成度、プロジェクト目標・上位目標の達成度・見込み）と実施プロセスを整理、確認する
ステップ 4：プロジェクト成果の発現を導いた、もしくは阻害することとなった要因（プロジェクトのデザインや実施プロセスにかかわるものを含む）を分析する
ステップ 5：「２－２　評価の基準」にて規定される 5 項目評価の観点から、プロジェクトを分析する
ステップ 6：分析から提言を導出する
ステップ 7：評価結果（案）を関係者と共有し、プロジェクトの将来的な方向を議論する
ステップ 8：評価結果について、日本側とミャンマー側の共通の見解を構築する

２－２　評価の基準

評価 5 項目の主な視点は次のとおりである。

（1）妥当性

プロジェクト目標や上位目標が、ミャンマーの開発政策や鉄道セクターに係る戦略計画、並びにわが国の援助政策との整合性がとれているか、ターゲット・グループのニーズと合致しているかなど、プロジェクトの正当性・必要性を検証、判断する。

（2）有効性

プロジェクト目標が計画どおり達成されるか、プロジェクト目標の達成が成果の達成によって引き起こされるものかなどにより、プロジェクトの実施によってターゲット・グループに便益がどのようにもたらされているかを検証し、判断する。

（3）効率性

プロジェクトが効果的に投入資源を活用したかという観点から、投入実績と成果達成の状況を踏まえて、投入（インプット）がどのように効率的に成果（アウトプット）に転換されたかを検証・評価する。

（4）インパクト

上位目標達成の見込みとプロジェクト実施によりもたらされる長期的・間接的な効果や波及効果の有無を検証し、判断する。

(5) 持続性

政策・制度面、組織面、財務面、技術面の観点から、プロジェクト終了後、プロジェクトで発現した効果がどのように定着・持続するかについて、検証・評価する。

２－３　評価グリッドとデータ収集方法

(1) 評価グリッド

本終了時評価では準備作業として本プロジェクトに関する既存資料をレビューしたうえで、評価５項目にかかわる詳細な評価設問と評価指標・データ収集方法等を記述した評価グリッド案（「付属資料４．評価グリッド」を参照）を作成した。評価グリッドは、①プロジェクトの実績、②実施プロセス、③５項目による評価、から構成される。

(2) データ収集方法

以下の情報とデータが本合同評価の情報源として活用された。

1) 日本人専門家、C/P、並びに実施機関の関係者のインタビュー（「付属資料２．主要面談者リスト」を参照）
2) プロジェクト実施前に遡って、また、実施中にまとめられたプロジェクト基礎資料
3) 日本側・ミャンマー側の投入とプロジェクト活動にかかわる記録（「付属資料３．投入実績」を参照）
4) 現場視察
5) プログレス・レポート（各年次、和文・英文）等、プロジェクトの上位目標やプロジェクト目標、成果の達成の程度を示すデータや情報を提供する文書
6) 政策文書など、プロジェクトの妥当性や持続性を裏づける資料

第３章　プロジェクトの実績と実施プロセス

３－１　プロジェクトの実績

３－１－１　投入

（1）日本側

日本側はプロジェクトに対し、以下の投入を行った（詳細は「付属資料３．投入実績」を参照）。

1）日本人専門家（付属資料３.の「３－１（1）専門家派遣」を参照）

プロジェクト開始からプロジェクト終了時評価までに、延べ 27 名の専門家が合計 79 人 / 月（コンサルタントの自社負担分の 8.52 人 / 月を含む）派遣されている。表－１に専門家の数、専門分野、派遣期間を示す。

表－１　日本人専門家の派遣分野と期間

派遣分野	人数	派遣期間（人 / 月）	うち自社派遣分（人 / 月）
総括/鉄道設備保線措置	1	4.83	
総括（延長期間）/鉄道設備保線措置・保線計画	1	5.66	
副総括/保線計画	1	13.17	
副総括/軌道計画（路盤）	1	2.96	
鉄道維持・運営改善	1	24.96	
資機材調達	3	2.10	
信号・通信	2	1.80	
車両	1	2.50	
軌道計画（1）	4	10.33	
軌道計画（路盤）	2	1.57	
運転	2	1.80	1.80
業務調整	1	3.13	3.13
軌道計画（2）	2	2.06	1.86
軌道計画（3）	2	0.70	0.50
軌道計画（4）	2	1.43	1.23
軌道計画（5）	1	0.00	
計	27	79.00	8.52

注：2016 年 1 月までの累計。

2）本邦研修（付属資料３.の「３－１（2）本邦研修」を参照）

日本側は MR の管理職並びに技術職に従事する職員計 33 名を対象として、「第 1 回軌道整備コース（2014 年 6 月 8 日～ 21 日、11 名）」、「第 2 回軌道整備コース（2014 年 6 月 22 日～ 7 月 5 日、11 名）」、「組織運営改善コース（2014 年 10 月 19 日～ 11 月 1 日、11 名）」の 3 回の本邦研修を実施した。

3）供与機材（付属資料３.の「３－１（3）供与機材」を参照）

プロジェクトの効果的な実施を支援するために、合計 6,200 万円（約 52 万米ドル）に相当する機材が日本側から投入された。

4）日本側運営費（付属資料３.の「３－１（4）プロジェクト運営費」を参照）

日本側からは、約 31 万 6,000 米ドル（約 3,800 万円）相当のプロジェクト運営費が投入された。

（2）ミャンマー側

ミャンマー側はプロジェクトに対し、以下の投入を行った（詳細は付属資料３.の「３－２ ミャンマー側投入実績」を参照）。

1）プロジェクト要員（C/P）（付属資料３.の「３－２（1）C/P 配置」を参照）

ミャンマー側は、プロジェクト・ディレクター、プロジェクト・マネジャー、及び延べ 19 名の C/P を配置した。

2）プロジェクト施設

ミャンマー側より、R/D にて規定された日本人専門家用のプロジェクト事務所スペースが提供された。ミャンマー側はまた、研修生の簡易宿泊施設を用意した。

3）ミャンマー側運営費

ミャンマー側はプロジェクト運営費として、現地の活動に必要な運営費を提供した。そのなかには、パイロットサイトでの業務に係る経費や材料、及び C/P の出張経費も含まれる。

３－１－２　成果の達成状況

2 つの成果（アウトプット）に係る各指標の達成度は、終了時評価時点で次のとおりである。

（1）成果 1 の達成状況

成果 1：安全性及びサービス向上のための維持管理に係る課題が整理されたうえで、改善計画が策定される。
指標 1−1　軌道、車両、信号・通信、運転にかかわる情報収集システムが確立される。
指標 1−2　事故原因の調査と分析に基づいて安全にかかわる事項がリスト化される。
指標 1−3　サービスにかかわる事項がリスト化される。
指標 1−4　問題に対応するためのサービスと安全改善計画が策定される。

以下に記すように、成果 1 に係る指標はそれらすべてが終了時評価時までに満たされていることから、成果 1 は達成された。

「指標 1−1　軌道、車両、信号・通信、運転にかかわる情報収集システムが確立される」に関して、プロジェクトは関連情報を収集するために、技術分野ごとに専門家と C/P を対に組んだ C/P チームを発足させた。同チームは総括とプロジェクト・ディレクター、副総括とプロジェクト・マネジャー、鉄道維持・運営改善専門家と同分野 C/P、保線専門家と同分野 C/P、資機材調達専門家と同分野 C/P、信号・通信専門家と同分野 C/P、車両専門家と同分野 C/P、運転専門家と同分野 C/P、軌道専門家と同分野 C/P から構成された。これらの関係者が鉄道運

営と車両にかかわる情報収集に際して重要な役割を担い、2 名の専門家による MR 本社や車両工場 3 カ所の現地調査も 2013 年 8 月から 9 月にかけて実施された。そのうえで、成果 1 を達成できるよう、専門家チームが作成した質問票への回答に即して「MR の安全性とサービスレベルの現状」がまとめられた。

「指標 1−2　事故原因の調査と分析に基づいて安全にかかわる事項がリスト化される」については、プロジェクトは 2014 年 2 月 10 日〜 28 日の日程で行われた研修のなかで、事故及びサービス状況の検証・分析方法に係るワークショップを実施した。同ワークショップにては、2012 〜 2013 年度に実際に起こったケースを分析して、事故やサービスレベルの低さ（列車の遅延やスピード制限）を示す 25 のトピックが選ばれ、それらの事例について、MR 関係者が原因を分析して対応施策を発表する機会がもたれた。

「指標 1−3　サービスにかかわる事項がリスト化される」については、プロジェクトは 2014 年 2 月 10 日〜 28 日の日程で行われた原因検証分析研修の開催後、サービス面の課題を明らかにするための顧客満足度調査を実施した。本調査はヤンゴン〜マンダレー本線のヤンゴン駅とネピドー駅間にて、運行中の車両内での聞き取りにて行われた。対象となったのは外国人を除く乗客である。全般的な満足度は残念ながら低かったが、満足度が低かった具体的な内容（乗り心地や列車スピード、定時性/遅延、清潔さ、座席の快適さ、職員の対応、予約について、待合設備）やそのレベルが明確になったことで、改善の対象が把握された。

同様に、「指標 1−4　問題に対応するためのサービスと安全改善計画が策定される」については、プロジェクトの初年度に、土木、信号・通信、運転、軌道技術にかかわる技術基準について関連性の高い項目が専門家から MR に紹介され、提言取りまとめの準備が開始された。その後、要旨が提言書に整えられ、その文書を基にプロジェクト関係者が協議を行った。その結果が、「短期（2015 〜 2018）、中期（2018 〜 2025）、長期（2025 〜 2045）鉄道設備改善計画策定のための技術基準に関する提言ワークショップ協議要約」として取りまとめられた。その後レビューを経て、「MR の技術基準と短期、中期、長期鉄道設備改善計画に係る提言報告書（改定）」が作成され、2014 年 12 月 15 日〜 19 日に開催されたまとめワークショップにて発表された。

（2）成果 2 の達成状況

成果 2：安全性及びサービス向上のための保線措置を通じ技術力が向上する。
指標 2−1　おのおのの対策について（30 名の技術職員を想定）技術移転が効果的に行われる。
指標 2−2　緊急軌道維持マニュアルが作成される。
指標 2−3　質・量の両面から適切な資機材が調達される。
指標 2−4　鉄道維持その他に係る技術向上のためのセミナー（3 回）、研修（3 回）を通じて C/P が必要な熟達レベルに到達する。

終了時評価（2016 年 1 月実施）の時点で、成果 2 に基づく活動は指標を上回る形で完了していることから、成果 2 は達成された。

「指標 2−1　おのおのの対策について（30 名の技術職員を想定）技術移転が効果的に行われる」については、プロジェクト開始以前のミャンマーでの保線作業は、日本でかつて行われ

ていたような、昔ながらの機械化されていない方法であったものを、プロジェクトを通じてMR の保線検査官と作業員は、大規模な維持管理機材を用いての基本的な維持管理システムについての研修を受けた。ヤンゴン～マンダレー線のヤンゴンとバゴーの間の 46.5 マイル区間（74.8 km）の約 20 km が、技術移転の一環としての保線のためのパイロット区間として選ばれた。現場踏査にて不良個所や良好箇所、直線区間や曲線区間、駅構内の分岐器、橋梁等、各種の軌道構造の保守を経験できることが確認され、維持管理を経験するためにふさわしいと判断されたものである。

プロジェクトは、2013 年 10 月の終わりから 2014 年の 5 月中旬にかけて、30 名から成るグループを対象として包括的な研修プログラムを実施した。技術移転の流れは以下のとおりである。MR 職員の保線技術のレベルを分析して彼らに適切なテキストを作成し、専門家が①保線現場実習（On the Job Training：OJT）の開始時、②保線作業の完了時、③ OJT 終了時の取りまとめ、の 3 つのステップに分けて、保線をより適切に行うためのセミナーを開催した。

研修から得るものが大きかったことで、2014 年 3 月の終わりに、MR はプロジェクトにダゴン大学線とティラワ支線も対象に含め、トーチャンカレー駅をパイロット区間とするよう要請した。プロジェクトは、内容とタイミングを見直して 1 カ月で完結するものに研修プログラムを改定することで、パイロット区間範囲の拡大を、研修をより多くの職員に提供する機会として活用した。研修の修了生は以降、元の職場に戻って習得した技術を運用している。この対象の拡大によって、プロジェクトは 500 名を超える研修修了生[2]を輩出した（2016 年 1 月終了時評価時）。MR の土木技術職員は 4,000 名ほどであることから、実にプロジェクトは保線に従事する従業員の 13％の技術に影響を与えたことになる。

延長期間に対応されるものとして計画されたその他の追加活動には、①保線の外注化に関する講義シリーズ（日本の経験の紹介を含む）と②橋梁に関するセミナーと研修コースがあり、それぞれのテーマを担当する専門家によって提供された。

「指標 2−2　緊急軌道維持マニュアルが作成される」に関しては、専門家は保線作業の全体を振り返ってポイントを要約し、気候なども含めて現地の状況に即した内容の 3 部構成のマニュアル、①安全作業マニュアル、②線路作業マニュアル、③線路検査マニュアル、をまとめた。編纂作業は専門家が担当したが、C/P は最終化に至るレビューの段階に協力した。

同様に、「指標 2−3　質・量の両面から適切な資機材が調達される」については、実状と状況を入念に分析したうえで、質・量の両面から適切な資機材が選定された。そのため、既に日本では使われなくなっている資機材の調達も含まれることになり、追加の時間の必要が生じた。このような手順によっていくつかの資機材の調達には遅れがあったが、ミャンマーの実状に適った資機材が投入されることを確実にした。

最後に、「指標 2−4　鉄道維持その他に係る技術向上のためのセミナー（3 回）、研修（3 回）を通じて C/P が必要な熟達レベルに到達する」については、セミナーを行ったうえで研修を実施するサイクルが 3 回実施された。それぞれのサイクルは、①検査、作業員計画や作業員の作業についての座学と、座学を踏まえての操車場での安全保護具（安全靴、ヘルメットや安全チョッキ）を着用しての実習と、②パイロット区間での実地作業（2013 年 10 月、2013 年 12

[2] 終了時評価報告書を合同評価調査団が最終化した後、第 9 回 JCC の会議中に、研修修了生の最終的な人数が 574 名であることが確認された。

月、2015 年 2 月）、から構成された。その他プロジェクト期間を通じて、新人検査官に対して導入指導が行われた。また、2016 年 2 月初頭に最終まとめセミナーの開催が計画されている。これは、プロジェクトの完了に先駆けて、研修修了生に振り返りの機会を提供し、疑問点を解消することを目的とするものである。パイロット区間での実地作業により、C/P の技術が必要なレベルに達していることが確認された。

3－1－3　プロジェクト目標の達成見込み

プロジェクト目標：ミャンマー国鉄の安全性及びサービス向上に資する運営・維持管理能力が強化される。
指標 1　事故原因分析と再発防止策並びにサービスレベル向上のための手段が MR によって確立/実施/継承される。
指標 2　保線維持管理のための事務・管理能力が向上し、その向上したレベルが MR によって維持される。

以下に記すように、プロジェクト目標は指標を満たす形で達成された。

「指標 1　事故原因分析と再発防止策並びにサービスレベル向上のための手段が MR によって確立/実施/継承される」に関しては、2014 年 2 月 10 日～ 28 日の日程で、事故やサービスレベルの低迷の原因を分析して対応策を立てるためのテクニックに MR 職員が親しむための研修プログラムが MR 本社にて実施され、土木作業、信号、軌道、並びに運転分野と MR 本社より 19 名の幹部職員の参加を得た。研修は①専門家によって作成された講義テキストを用いての座学、②ワークショップ、③車両の振動測定器の使用に係る実習、の 3 部から構成された。研修の後、サービス水準に係る改善点を把握するため、顧客の満足度を調べるインタビュー調査も実施された。全般的な満足度は低かったが、満足度の低い項目が具体的に明らかになり、改善計画が策定された。プロジェクトにて作成されたマニュアルは現在、日々の実務で主に検査官によって活用されていることが、終了時評価の現地インタビューにて確認された。さらに、これらのマニュアルは、彼らが 2 年ごとに受ける更新試験（refresher exam）準備の復習教材としても参照されているとのことであった。このことから、マニュアルが継続的に活用され、MR の組織内において継承されることが期待される。

「指標 2　保線維持管理のための事務・管理能力が向上し、その向上したレベルが MR によって維持される」に関しては、終了時評価の一環としてパイロット区間にて実施した研修修了生とのインタビューにて、プロジェクトが導入した（プロジェクトの提供による資機材を用いての）保線技術と安全に関する業務慣習（指さし確認や安全靴、ヘルメットや安全チョッキ等の安全保護具の使用）が、研修修了生の保線作業のなかに根づいていることが確認された。今後は、研修修了生がミャンマー各地に戻って保線技術と安全に関する業務慣習を広め、MR のエリア全体に浸透することが期待されることから、MR によって事務・管理能力が維持される可能性が高いといえる。

以上より、サービス改善に係るマニュアルが日々の実務において使用され、また保線技術と安全に関する業務慣習が定着し、それらが継続的に維持される見込みであることから、MR の安全性及びサービス向上に資する運営・維持管理能力は強化されたと考えられる。

３－１－４　上位目標の達成見込み

上位目標：ミャンマー国鉄の安全性及びサービスが向上する
指標 1　ヤンゴン～マンダレー間の年間事故件数が現在並びに過去の記録に比して減少する
指標 2　ヤンゴン～マンダレー線の速度が現在に比して増速される
指標 3　現状よりヤンゴン～マンダレー線の急行のスケジュールが厳守される

指標の「現在」という言葉は、当初 PDM から PDM ver.2 に改定された 2013 年を指すと思われる。よって、プロジェクトの完了後、3 ～ 5 年に上位目標が達成される見込みは、2013 年のデータと終了時評価時に最も近い時点でのデータ、という最低 2 つの時点の数値を比較して推定される必要がある。調査団は、これら 3 つの指標について入手可能な最新データの提供を求めたが、終了時評価インタビュー期間にそのようなデータの提供を受けることができなかった。これらのデータがないなかでは、現時点での上位目標の達成見込みは断定できない。しかしながら、安全性や運行のサービスレベルに係るこれら指標の重要性から、MR によって記録が取られることが強く推奨される。

３－２　プロジェクトの実施プロセス

３－２－１　活動の実施と活動におけるオーナーシップ

専門家が提案し、ミャンマー側の意見を仰いで両者の合意にて適切な形に整えられたプロジェクトの活動は、その順序や段階が詳細に組まれた手順に則ってすべてが実施された。効果の高い実施を可能にするために、プロジェクトは日本側とミャンマー側の管理と技術それぞれの代表者を対に組んで「サービスと安全向上のためのワーキンググループ」を設立した。グループメンバーは、総括とプロジェクト・ディレクター、副総括とプロジェクト・マネジャー、鉄道維持・運営改善専門家と同分野 C/P、保線専門家と同分野 C/P、資機材調達専門家と同分野 C/P、信号・通信専門家と同分野 C/P、車両専門家と同分野 C/P、運転専門家と同分野 C/P、軌道専門家と同分野 C/P である。

事故原因やサービスレベルの低迷の分析と対策の協議が効果的に行われるよう、プロジェクト実施中に、MR 本社に所属するミャンマー側の専門家数名が C/P チームに加えられた。実施機関のオーナーシップが示され、実際にそのオーナーシップが果たされた好例といえる。

３－２－２　プロジェクト管理

専門家は、例えば南管理局のゼネラルマネジャーへの週報などを通じて、MR 幹部層との定期的なコミュニケーションに努めた。しかし、プロジェクトの現場はヤンゴン近郊を中心とする一方で MR 本社はネピドーにあることから、密なコミュニケーションを維持することには多少の課題があった。通常、JICA プロジェクトは合同調整委員会（Joint Coordinating Committee：JCC）を年に 2 回開催しており、本プロジェクトにても当初は同様の間隔が当初採用された。ミャンマー側の積極的な提案により、その後四半期ごとの開催に変更された。プロジェクトにとっては、この変更によって会合準備のための負荷が高まることとなったが、より頻繁な開催は JCC メンバー間、すなわちプロジェクト内のより密なコミュニケーションを可能にした。

第4章　評価結果

4－1　5項目による評価

4－1－1　妥当性：高い

以下の4つの観点から、本プロジェクトの妥当性は高いと評価される。

(1) ミャンマー政府の政策との整合性

2016年1月にミャンマー政府によって国家運輸交通マスタープランとしてその内容が採択された「全国運輸交通プログラム形成準備調査ファイナルレポート（2014年9月）」は、MRが旅客及び貨物運輸サービスの提供の維持に必要な役割を担っていることを認めている。一方で同文書では、速度と事故管理面からの鉄道輸送サービスの質が、特に劣化した軌道状態と維持管理が行き届いていない古い旅客車や貨物車のために低いことを指摘しており、同国サブセクターの優先課題に関する本プロジェクトの整合性を裏づける。

(2) ミャンマー政府の鉄道運輸セクターに係る戦略/計画との整合性

プロジェクトの有効性を向上させるため、技術移転の対象となるターゲット職員の数を増加させるようMR側に要請されたことを受けて、研修生は当初の30名から本終了時評価時（2016年1月）までに500名を超えるに至った[3]。パイロット区間についても同様であり、ダボン大学線とティラワ支線のトーチャンカレー駅周辺が含まれるよう、その拡大が要請された。これらプロジェクトの対象が拡げられたことは、プロジェクトの最終的な裨益者である顧客により良いサービスを提供するためのニーズに非常に合致している証といえる。MRの土木技術職員は4,000名内外であることから、プロジェクトは3年以内のプロジェクト期間に保線に従事する職員の約13%に影響を与えたことになる。

(3) 日本のODA政策との整合性

外務省対ミャンマー経済協力方針（2012年4月21日）である「今後のわが国の対ミャンマー支援」にて提唱されている、「持続的な経済成長のために必要なインフラ」や「制度整備等の支援」のなかで鉄道の運営改善・近代化が重要課題とされていることを受けて、本プロジェクトは実施された。現在も同協力方針が有効であることから、プロジェクトの関連性は高い。

(4) 日本の経験や技術の比較優位

日本が第二次世界大戦後、それまでに蓄積した鉄道インフラのノウハウ（図面等を含む）を失ったなかで今日までセクターを開発・発展させた経験は、ミャンマーの現状に寄り添った技術移転の実施に際して、同国の文脈を十分に汲んだものにつくり上げることに役立った。また、きめ細やかな視点での機材管理や世界的に定評のある安全管理の姿勢は、日本の本分野の支援の優位性に対する評価を揺るぎないものにしている。

[3] 最終的な研修修了生総数は574名。

４－１－２　有効性：高い

「３－１－２」と「３－１－３」の項にて既に記されているように、成果 1 及び成果 2 を通じて着実な結果を実現しており、設定された指標を満たしてプロジェクト目標を既に達成していることから、本プロジェクトの有効性は高いと評価される。

プロジェクトの達成は、ミャンマーに適切な日本製の資機材と、高い技術の専門性のみならず人間味あふれる専門家という、バランスのとれた投入によってもたらされた。終了時評価のインタビューにて、プロジェクト・ディレクターからは、本プロジェクトで経験したことは MR にとって初めてのことばかりであり、よって結果はすべてプロジェクトによるものであるという旨の発言があった。

プロジェクトの骨格は、（セミナーでの）座学と（運行に使われていない軌道を使って、また実際の OJT 作業を通じての）実務を通して、また（マニュアル等の）ナレッジを蓄積しながら、関連する技術能力を培うために適切に組み立てられていたが、プロジェクトはさらに、MR が別組織から得る支援に助けられた面もある。その一例は、ヤンゴン～マンダレー線用に日本の鉄鋼メーカーから MR にレールの寄付があったことである。この提供は、プロジェクトによって培われた、技術を基盤としたスキルを試す機会となったためである。

４－１－３　効率性：高い

プロジェクトが結果を導出するにあたっての、投入と成果の関連性を下に記す 4 つの観点から検討した結果、プロジェクトの効率性は高い。

（1）投入と成果の関連性

技術移転の対象内容や技術要件の種類（すなわち、より機械化された保線作業）は C/P にとって新しい試みであり、プロジェクトの介在がなければ MR が導入することはなかった手法である。そのため、プロジェクトの投入と成果の間には直接の因果関係があったといえる。

（2）前提条件の達成

プロジェクトの開始時点で設定された重要な前提条件である「政府の MR に対する支援が、特に財政面にて確保される」は、成果の産出を支える条件として満たされた。

（3）日本による投入の適切さ

計画された投入は、プロジェクトの効果的な実施のために確保された。日本人専門家については、細分化された専門ニーズに的確に対処するために、特に保線分野については 5 名の専門家がそれぞれの専門分野を担当した。延長期間を含むプロジェクトの全体期間（2013 年 5 月～ 2016 年 1 月）に 79 人 / 月の専門家投入が行われた。このうち 11％は、プロジェクトの成果と持続性を高めるために、専門家が所属するコンサルタント企業の提案/申し出によって同企業が負担した。

2015 年 5 月のプロジェクト終了を控えた段階で、保線に係る研修の継続、保線維持外注化に関する講義の実施、橋梁維持に関する研修実施の要望がミャンマー側から寄せられ、プロジェクト期間は 2016 年 3 月まで延長された。この延長により、保線に係る研修をミャンマー全国から集められた 574 名に実施することができ、プロジェクトの提供する保線技術を MR

全体に広げるための素地をつくることができた。

MR の現状にかんがみて選ばれたいくつかの資機材については、既に日本では使われなくなっているものがあったことから、それらの調達とミャンマーへの輸入にあたって追加の時間を要し、日本からの機材が到着したのはプロジェクト開始後約半年経ってからであった。終了時評価でのインタビューにて、プロジェクトが導入した日本からの資機材に対する C/P の必要性や評価に関するコメントは、感謝の言葉とともに、資機材を非常に高く評価するものであった。これらのコメントには、ハンドタイタンパーの使い勝手の良さ（従来ミャンマーで使用されていた大型機器より扱いやすい）や振動測定器の精度の高さが含まれる。全体として、プロジェクトを通じてそれまで触れたことのなかった資機材を使用する機会を得たことで、C/P は、より機械化された保線作業にそのレベルを一段上げることができた。

本邦研修は、信号や駅の安全ドアなど、日本のシステムの見学を通して目を見張る物事を体験できたと C/P から高く評価された。それらのシステムすべてをすぐにミャンマーに導入できなくとも、いくつかの保線技術は応用させることが可能であり、その点も含めて啓発の機会となった、という発言が終了時評価にてインタビューを受けた本邦研修参加者から聞かれた。

以上、プロジェクト延長により保線技術をミャンマー国全体に広げる見通しができたこと、提供した資機材や本邦研修が C/P の技術向上をもたらしたことから、日本側からの投入は適切であったと考えられる。

(4) ミャンマー側による投入の適切さ

ミャンマー側もプロジェクト活動を支えるためのリソースを確保する努力を行った。パイロットサイトでの作業に係る経費やそのための資機材、及び C/P の旅費を負担している。また、ミャンマー側は研修生の簡易宿泊施設も提供した。これらはプロジェクト活動に過不足ないものであり、ミャンマー側からの投入は適切になされたといえる。

４－１－４　インパクト：中程度

「３－１－４　上位目標の達成見込み」の項にて既に記したように、時間軸で最低限 2 つの比較データが入手できないことで、プロジェクトが上位目標達成に向けて順調に歩みを進めているかを終了時評価時点で判断することは不可能である。しかし、プロジェクトの過程で収集された情報や策定された改善計画は、「鉄道中央監視システム及び保安機材整備計画（2013-2014）」や「ヤンゴン・マンダレー鉄道整備事業詳細設計調査」等、MR が JICA と実施する他の活動にも資しており、今後もその傾向が見込まれる。このような相乗効果（synergy）は、上位目標の達成に向けて、プロジェクトの結果に正の影響を与えることが期待できる。

MR の職員構造が今後もこれまでと同様の推移であれば、上位目標達成の外部条件として設定された「運営職員が他部署等に大幅に異動しない」「技術職員が他部署等に大幅に異動しない」はプロジェクト完了後、3 ～ 5 年後に実施される事後評価にてインパクトが計測される際にその条件が満たされていると推測される。

このように、上位目標を達成する見通しを構成する要素の見込みに差異があることから、インパクトは中程度である。

４－１－５　持続性：中程度

（1）制度面：高い

2016 年 1 月にミャンマー政府によって国家運輸交通マスタープランとしてその内容が採択された「全国運輸交通プログラム形成準備調査ファイナルレポート（2014 年 9 月）」は、MR が旅客及び貨物運輸サービスの提供の維持に欠かせない役割を担っていることを認めている。ミャンマーの国家発展のためには、MR が市民（旅客サービス）とビジネス（貨物サービス）に連結性（connectivity）をもたらす重要な役割を果たす状況は続くものと考えられることから、制度面からみた持続性は高い。

（2）組織面：中程度

現状の組織構造からみた持続性は、中程度と考えられる。

組織に対する追い風要因の 1 つに、2016 年 1 月に新たに承認された鉄道法が挙げられる。新法の制定によって MR はこれまでの規則や規制を見直して新しいものを整備していく必要があり、その際には、プロジェクトが作成したマニュアルや各種文書を参照することができる。このようなコメントが MR の幹部から出されており、プロジェクトが蓄積した経験を MR が活用する意義を見出している、1 つの局面であるといえる。

プロジェクトの結果がより幅広く、組織の全体に持続性として定着するためには、MR の組織構造をレビューして、安全課題について部局を越えて横断的に所掌する部署を置くべきかについて、検討の意義があると思われる。今回プロジェクトは主に土木局と活動したが、横断的に安全を所掌する部局をもって組織全体のアジェンダとして主流化していくことは、MR を安全課題により強い組織にするであろう。

（3）技術面：中程度

研修修了以降、修了生は全国にある元の職場に戻って習得した技術を運用している。研修生の人数・範囲を拡大したことによって、プロジェクトは 500 名を超える研修修了生を輩出した（2016 年 1 月終了時評価時）[4]。MR の土木技術職員は 4,000 名ほどであることから、プロジェクトは実に保線に従事する従業員の 13％もの技術力向上に影響を与えたことになる。

研修生の人数や範囲が拡大されたことを受けて、プロジェクトは追加資機材を用意した。これらの資機材については、各管区に機材が 1 セットずつ配分されることが重要であることが第 8 回 JCC にて既に同意されている。しかし終了時評価時点で配分は完了していなかった。そのため、プロジェクトが終わる前に、研修を受けた職員がプロジェクトより授かった技術を維持できることを担保する形で、資機材の供与を完了させることが重要である。終了時評価時点では資機材の配分が完了していないことから、技術面からみた持続性は中程度と評価した。

（4）財務面：中程度

独占国営企業である MR は、国で唯一の大量輸送機関として赤字を抱えながら運営を続けてきた。この運営方式は今後も続くと思われることから、プロジェクトが生みだした結果を進

[4] 最終的な研修修了生総数は 574 名。

展させるためにどの程度の資源をMRに注入するかは、組織の判断と決断に委ねられる。本報告書にても複数回記されたように、国家としてMRに重要性を付していることから、今後も企業体として存続することに疑問の余地はない。MRは赤字体質ではあるが、国営企業として国から財政的な補填を受けることができ、鉄道の重要度も高いとみなされていることから、現状の財務面は中程度と考えられる。

プロジェクトが成し遂げたことをその完了後にミャンマー側が維持/拡大するためには、さらなる努力の余地がある。例えば、横断的な部署を設置することで安全性にかかわる課題対応を主流化させる、タイミングを逃さずにプロジェクトの研修修了生が戻った所属先への追加資機材配付を完了させる、プロジェクトが産出した結果を継承するための投資を可能にするために、財務体質が良好かを重視するなどである。よって、本プロジェクトによって発現した効果の持続性は中程度である。

４－２　結論

本プロジェクトは、①ミャンマー政府の国家政策との整合性、②同国の鉄道運輸セクターに係る戦略的な方向性との整合性、③日本のODA政策との整合性、そして④日本の経験や技術の比較優位にかんがみて、妥当性は高い。プロジェクトの完了に先駆けてプロジェクト目標を達成していることから、プロジェクトの有効性は高い。プロジェクトが結果を導出するにあたって、①投入と成果の関連性、②前提条件の達成、③日本による投入の適切さ、及び④ミャンマー側による投入の適切さ、の観点から判断すると、プロジェクトの効率性は高い。一方で、設定された指標に基づいての上位目標の達成見込みは断定できない、もしくは見通しを構成する要素の見込みに差異があることから、インパクトは中程度である。実施機関が置かれた政策面、組織面、技術面、及び財務面の総合的な検討に基づくと、本プロジェクトによって発現した効果の持続性は中程度である。

よって終了時評価チームは、プロジェクトがプロジェクト目標を十分に満たす形で成功裏に実施されたことを確認し、2015年4月6日に締結された協議議事録（Minutes of Meeting：M/M）に基づいての完了という結論に至った。

第５章　提言と教訓

５－１　提言

調査団は、調査結果に導かれた以下の点について、プロジェクトの残りの期間、及び上位目標の達成に向けてプロジェクト完了後に取り組まれることを提言する。

５－１－１　プロジェクトの完了までに取り組まれるべきこと

(1) 各管区へ最低 1 セットずつの資機材供与

研修生の人数や範囲が拡大されたことを受けて、プロジェクトは追加資機材を用意した。これらの資機材については、各管区に機材が 1 セットずつ配分されることが重要であることが第 8 回 JCC にて同意された。しかし終了時評価時点で配分は完了していなかった。そのため、プロジェクトが終わる前に、研修を受けた職員がプロジェクトより授かった技術を維持できることを担保する形で、資機材の供与を完了させることが重要である。

５－１－２　プロジェクトの完了後、3 ～ 5 年後に上位目標を達成するために検討されるべきこと

(1) 保線に係る研修の定期的な実施

保線に係る技術移転の範囲が拡大されたことから、移転する技術を活用した基本的な保線の研修を、MR の土木職員 4,000 名ほどのうち、約 13％に当たる 574 名を対象に行うことができた。そのため、MR は既に、この技術を全国に広げる素地を有している。これらの技術に係る研修が、MR の現行の研修に組み込まれることが望まれる。

(2) 安全課題を横断的に所掌する部署の設置

本プロジェクトでは、保線面からの安全性とサービスの向上を主眼に置いた。上位目標の達成は、保線以外の物事も含む、包括的な対応によって支えられる。MR が組織を挙げて安全性の向上に取り組むためには、安全課題について部局を越えて横断的に所掌する部署の設置について検討の意義があると思われる。

(3) 安全性や運行のサービスレベルに係る指標の記録

上位目標については、最低 2 つの時点の数値を比較しないとその指標が満たされているか判断ができない性質のものをプロジェクトでは導入した（例：2013 年と 2014 年の運行速度）。しかし、終了時評価時点までに、そのようなデータが取りまとめられていなかったことから、調査団は、現時点での上位目標の達成見込みは断定できない、もしくは低いと結論づけざるを得なかった。安全性や運行のサービスレベルに係るこれら指標の重要性にかんがみ、MR によってこれらの記録が取られることが強く推奨される。

５－２　教訓

以下は、本プロジェクトから導かれる、JICA の類似案件の参考に資する教訓である。

(1) C/P に最も適した資機材の供与と技術移転計画の作成

それぞれの分野で高度な知識と技術を有する専門家たちがMRの作業環境を精査し、彼らに最も適した資機材と技術移転の内容を選んだ。十分に練られた計画と実施手順を実施機関と専門家が擦り合わせながら進めたことで、しっかりと現地に根づく（solid）技術移転を達成することができた。

(2) 日本の先進技術を紹介する本邦研修の実施

プロジェクトを担当した専門家チームは、日本国内の先進技術を用いた鉄道運営を広くC/Pに紹介できる資源へのアクセスを有していたことから、C/Pにとって具体的かつモチベーションの向上に役立つ事例が盛り込まれた本邦研修を実現できた。この経験が実施機関の職員に大きな刺激となったことは疑う余地がなく、その後のプロジェクト活動により活気を与えた。

(3) 指標データ記録体制のプロジェクト初期からの確立

上位目標について、最低2つの時点の数値を比較しないとその指標が満たされているか判断ができない性質のものをプロジェクトでは導入した（例：2013年と2014年の運行速度）。しかし、終了時評価時点までに、そのようなデータが取りまとめられていなかったことから、調査団は、現時点での上位目標の達成見込みは断定できない、もしくは低いと結論づけざるを得なかった。

第6章　第9回合同調整委員会（JCC）席上での、終了時評価に関連するコメントについて

以下に、2016年1月29日に開催された第9回JCCの協議のなかで、本終了時評価結果に関連して出された発言について記す。

（1）上位目標の指標について

プロジェクト専門家より、上位目標に係る3つの指標それぞれの内容が具体的に説明され、プロジェクトがめざした到達目標に対する達成状況が引き続きミャンマー側に確認され、継続して計測が行われるよう要請があった。調査団よりも、安全性とサービスの向上度を把握するために、指標の記録を取り続けてほしい点につき、終了時評価結果を引用して説明を行った。

JCC開催の前日に合同評価調査団による報告書（案）の最終確認が終わっていたが、JCC当日の開催間際に、ミャンマー側から指標関連データ3種が提出された[5]。終了時評価調査団がその場で内容を確認したところ、①事故件数指標について、数値の定義が詳細計画策定時と異なると思われるために、指標の数値が大きく異なっていた（具体的には、詳細計画策定時にはヤンゴン～マンダレー間の2011～12年度の事故件数が118件とされていたのに対し、ミャンマー側から終了時評価時に提出された資料には、2012～2015年の同区間での事故件数がそれぞれ40件、27件、16件、26件とされていた）、②制限速度について、2013年の区間別速度制限の一覧表の提供のみであり、比較しての分析ができないなど、データ計測者もしくは提供者に計測手法等の確認をすることなくその場で援用して終了時評価結果に加味することはできない内容であった。そのため、それらの追加提供データを評価に加味することはせず、終了時評価調査団の当初の勧告どおり、継続的な記録を依頼する提言にとどめた。

（2）追加投入された資機材の配付について

終了時評価調査結果を踏まえて、調査団より、プロジェクトの研修修了生の現場に資機材が配付されることの重要性が説明され、ミャンマー側の迅速かつプロジェクトの目的に沿った配付の完了が要請された。プロジェクト専門家よりも、プロジェクトの研修修了生がその後の自身の持ち場での実践活用のために、プロジェクトが追加で投入した資機材の配付は全国にわたるよう、重ねて依頼が行われた。

これらのコメントを受けて、実施機関のプロジェクト・マネジャーより、プロジェクトの研修にて得た技術の再移転と、着実な機材配付に関する意思が表明された。

（3）プロジェクトに参加した研修生の最終的な数について

調査団の報告書取りまとめの段階では、プロジェクトの研修を修了したMRの職員数は500名強、という説明であったことから、JCCにて署名捺印された報告書（英文）にはその数は500名強となっている。JCCの席にて、最終的な研修生数が574名であることが確認されたた

[5] “Indicator for Earning, Tonnage & Ton Mile and Locomotivve (From FY2011-2012 to FY2015-2016),” “Sanction Speed of Section by Section on Yangon-Mandalay Line (mph),” and “Summary of Number of Annual Accidents on Yangon-Mandalay Rail Line (From 2012 -2015)”（原文まま）

め、本稿の該当箇所に注記にて 574 名を記している。

（4）維持管理に係る予算確保について

MR が橋梁の維持管理に活用できる予算は、年間 3,000 ～ 4,000 万チャット程度であり、十分な修理ができないことが悩みである点について、プロジェクト・マネジャーから言及のうえで、来期の増額をめざす点のコメントがあった。

しかし、本プロジェクトの対象 C/P は MR 組織の土木局であり、このような財務面の変更を求めるためには、本議論が財務所掌部署をも含めて行われる必要がある。その点にかんがみ、プロジェクト・マネジャーの発言のみを受けて本終了時評価の 5 項目評価の持続性に加味することは控えた。

付　属　資　料

1．調査日程
2．主要面談者リスト
3．投入実績
4．評価グリッド（評価結果）
5．プロジェクト・デザイン・マトリックス（PDMe）
6．Joint Terminal Evaluation Report

１．調査日程

付属資料１：調査日程

Date		Schedule
17-Jan	Sun	00:20 Haneda (TG661) → 05:25 Bangkok 08:00 Bangkok (TG303) → 08:45 Yangon (Evaluation and Analysis)
18-Jan	Mon	09:00 Project Office 11:00 JICA Office 13:30 Japanese Expert Interview
19-Jan	Tue	07:00 Yangon (KBZ) → 8:00 (delayed to 12:30) Nay Pyi Taw 14:00 Meeting with Japan training participant 14:30 Meeting with Mr. Aung Win / GM (Technical & Admin), MR (Project Director) with his team 15:00 Meeting with Mr. Maung Maung Thwin, DGM (Civil), MR (Deputy Project Manager) 18:35 Nay Pyi Taw Dep (FMI) → 19:35 Yangon
20-Jan	Wed	10:00 Meeting with Mr. Htun Aung Thin, GM Lower Myanmar Administration 15:00 Meeting with Mr. Tin Myint, AGM (Civil), Division 7
21-Jan	Thu	08:30 Visit Toe Kyang Ka Lay Station area (Pilot Section) PM Data Analysis
22-Jan	Fri	AM Yangon Station for site visit on train control Reflection Meeting with Project PM Data Analysis
23-Jan	Sat	Report drafting (Evaluation and Analysis)
24-Jan	Sun	Report drafting (Evaluation and Analysis) 11:45 Narita (NH813) → 17:15 Yangon (Leader, Evaluation Management)
25-Jan	Mon	13:00 Meeting with Mr. Htun Aung Thin, GM, Lower Myanmar Adm. 14:00 Meeting with JICA Office 17:15 Yangon (FMI) → 18:15 Nay Pyi Taw (all members)
26-Jan	Tue	AM Internal Team Meeting on Draft Evaluation Report 15:00 Discussion with Mr. Tin Soe, GM (Civil), Mr. Maung Maung Thwin, DGM (Civil), MR (Deputy Project Manager) and Civil staff on Draft Joint Evaluation Report
27-Jan	Wed	Draft Evaluation Report Review by Myanmar side 13:00 meeting with Mr. Aung Win / GM (Technical & Admin), MR (Project Director), Mr. Tin Soe, GM (Civil), Mr. Maung Maung Thwin, DGM (Civil), MR (Deputy Project Manager), other senior MR members
28-Jan	Thu	16:00 Confirmed with Myanmar side on no-change to Draft Report
29-Jan	Fri	10:00 Joint Coordinating Committee (JCC) / MM Signing 17:30 Nay Pyi Taw (FMI) → 18:30 Yangon (All mission members) 22:10 Yangon (NH814) (Leader, Evaluation Management)
30-Jan	Sat	→ 06:45 Narita (Leader, Evaluation Management) 19:50 Yangon (TG306) → 21:45 Bangkok 23:15 Bangkok (TG682)
31-Jan	Sun	→ 06:55 Haneda (Evaluation and Analysis)

２．主要面談者リスト

付属資料２：主要面談者リスト

１．ミャンマー国鉄

氏　名	役　職	プロジェクトにおける役割
Mr. Aung Win	General Manager (Technical & Admin)	Project Director
Mr. Tin Soe	General Manager (Civil)	Project Manager
Mr. Maung Maung Thwin	Deputy General Manager (Civil)	Deputy Project Manager
Mr. Htun Aung Thin	General Manager, Lower Myanmar Administration	
Mr. Maung Maung Than	Deputy General Manager (Civil)	C/P
Mr. Win Bo	Assistant General Manager (Civil)	MR Headquarters (Civil)
Mr. Zaw Min U	Divisional Engineer (Civil)	MR Headquarters (Civil)
Mr. Zaw Ye Myint	Assistant Engineer (Civil)	MR Headquarters (Civil)
Ms. Daw Khim May Than	Assistant Manager (Planning & News)	Participant of Training in Japan

２．専門家

氏　名	分　野
松尾　伸之	総括/鉄道設備保線措置・保線計画（延長期間） 副総括/保線計画
髙見　満	副総括/軌道計画（路盤)(延長期間） 軌道計画（路盤） 業務調整[6]
小松　博史	鉄道維持・運営改善

[6] 当初 M/M に業務調整は計画されておらず、本業務への対応についてはコンサルタントの自社負担扱いでの派遣となった。

付属資料３：投入実績

３－１　日本側投入実績

（1）専門家派遣

分　野	氏　名	派遣期間（人/月）					
		2013	2014	2015	2016	Total	うち自社派遣分
総括/鉄道設備保線措置	黒田　定明	1.53	2.80	0.50		4.83	
総括（延長期間）/ 鉄道設備保線措置・保線計画	松尾　伸之						
			4.90	0.76	5.66		
副総括/保線計画	松尾　伸之	4.53	6.07	2.57		13.17	
副総括/軌道計画（路盤）	髙見　満			2.23	0.73	2.96	
鉄道維持・運営改善	小松　博史	4.27	10.27	9.20	1.22	24.96	
資機材調達	合月　智弘 （中村　剛） （谷口　雄一）	1.07	0.70	0.30	0.03	2.10	
信号・通信	三谷　竜平 （竹村　喜市）	0.23	1.57			1.80	
車両	石川　誠	0.50	1.80	0.20		2.50	
軌道計画（1）	羽賀　修 （藤原　英夫） （若月　雅人） （村尾　和彦）	1.47	4.13	4.73		10.33	
軌道計画（路盤）	高見　満 （宮本　潔）	0.03	1.54			1.57	
運転	森原　俊二 （五十嵐　英晴）	0.50	1.30	0.47		1.80	1.80
業務調整	高見　満	2.26	0.40	0.47		3.13	3.13
軌道計画（2）	小林　惠一 （三井　久芳）	1.73	0.13	0.20		2.06	1.86
軌道計画（3）	戸矢　真琴 （田中　成徳）	0.50		0.20		0.70	0.50
軌道計画（4）	小松　久志 （伊藤　隆）	1.23		0.20		1.43	1.23
軌道計画（5）	小山内　政廣[7]					0.00	
Total						79.00	8.52

[7] 終了時評価以降の派遣予定分。

（2）本邦研修

日本側は MR の管理職及び技術職に従事する職員計 33 名を対象として、「第 1 回軌道整備コース（2014 年 6 月 8 日～ 21 日、11 名）」、「第 2 回軌道整備コース（2014 年 6 月 22 日～ 7 月 5 日、11 名）」、「組織運営改善コース（2014 年 10 月 19 日～ 11 月 1 日、11 名）」の 3 回の本邦研修を実施した。

「軌道整備コース」は講義、OJT と振り返り、及びフィールド視察から構成された。「組織運営改善コース」は講義、ディスカッション / プレゼンテーション、及び視察から構成された。

以下がそれぞれのコースの参加者である。

1）第 1 回軌道整備コース（2014 年 6 月 8 日～ 21 日）

	Name	Position Title	Affiliation
1	Mr. Ye Htut	Assistant Engineer (Civil)	Nay Pyi Taw
2	Mr. Kyaw Lwin	Assistant Engineer (Civil)	Division (3)
3	Mr. Saw Naing	Permanent Way Inspector (1)	Division (3)
4	Mr. Aung Swe	Permanent Way Inspector (1)	Division (6)
5	Mr. Han Tin Soe	Permanent Way Inspector (1)	Division (8)
6	Mr. Win Nyunt	Permanent Way Inspector (2)	Central Institute of Transport and Communication, Meiktila
7	Mr. San Yu	Permanent Way Inspector (2)	Division (1)
8	Mr. Chit Ko Ko	Permanent Way Inspector (2)	Division (2)
9	Mr. Than Naing	Permanent Way Inspector (2)	Division (3)
10	Mr. Aung Thein Win	Permanent Way Inspector (2)	Division (6)
11	Mr. San Naing	Permanent Way Inspector (2)	Division (6)

2）第 2 回軌道整備コース（2014 年 6 月 22 日～ 7 月 5 日）

	Name	Position Title	Affiliation
1	Mr. Soe Myint Aung	Assistant Engineer (Civil)	Division (4)
2	Mr. Aye Nyeub Swe	Assistant Engineer (Civil)	Division (3)
3	Mr. Han Thein	Permanent Way Inspector (1)	Division (11)
4	Mr. Kyaw Thu Ya	Permanent Way Inspector (1)	Katha-Bahmo
5	Mr. Moe Kyaw Aung	Permanent Way Inspector (2)	Yangon-Pathein
6	Mr. Kyaw Htet Zaw	Permanent Way Inspector (2)	Division (6)
7	Mr. Aye Min Aung	Permanent Way Inspector (2)	Division (11)
8	Mr. Kyaw Tun Linn	Permanent Way Inspector (2)	Division (2)
9	Mr. Aung Aung	Permanent Way Inspector (2)	Division (5)
10	Mr. Hla Htay Win	Permanent Way Inspector (2)	Division (4)
11	Mr. Thaung Tun Aye	Permanent Way Inspector (3)	Division (5)

3）組織運営改善コース（2014 年 10 月 19 日～ 11 月 1 日）

	Name	Position Title	Affiliation
1	Mr. Win Naing	Deputy General Manager (Carriage)	Headquarters
2	Mr. Htay Myint Aung	Deputy General Manager (Operation)	Headquarters
3	Ms. Daw Kyi Kyi Nwe	Assistant General Manager (Finance)	Mandalay Branch
4	Mr. U Lwan Thu	Executive Engineer (Civil)	Bago Branch
5	Mr. Maung Maungt Tin	Manager (Supply)	South Myanmar Region
6	Mr. Aung Chan Myint	Manager (Commercial)	Headquarters
7	Mr. Myint Lwin	Executive Engineer (Communication)	Yangon Branch
8	Mr. Aung Wai Soe	Assistant Manager (Inspection)	Headquarters
9	Ms. Daw Khin May Than	Assistant Manager (Planning & News)	Headquarters
10	Mr. U Nyo Aung	Assistant Engineer (Electric)	Yangon Branch
11	Mr. Aung Mying	Assistant Manager (Planning)	Headquarters

（3）供与機材

分　類	金額（JPY）	備　考
保線 OJT 検測用機器	9,490,600	
検測用器具	374,800	
作業用機械・器具	46,059,959	
保線作業用備品・材料	2,611,000	見込み
橋梁維持管理 OJT 橋梁点検等作業道具	243,000	
保安用具（ヘルメット、安全チョッキ、安全靴、軍手など）	2,869,000	見込み
合計（約）	61,648,359	

(4) プロジェクト運営費

Category	Description	Amount				
		Unit	FY2013 (from May)	FY2014	FY2015 (up to Nov)	Sub-Total
Local staff	Secretary	USD	8,024	12,647	9,779	30,450
Local staff	Interpreter for office	USD	10,847	16,263	11,891	39,001
Local staff	2interpreter and 2 engineers for track OJT	USD	10,961	38,584	21,734	71,279
Local staff	interpreter for JCC and other	USD	3,055	3,400	6,550	13,005
Local staff	Accommo	USD	1,200	935	553	2,688
Air		USD	4,132	3,220	1,905	9,257
Car Rental	for track OJT	USD	18,322	30,428	21,583	70,333
Car Rental	for JCC and other activities	USD	5,701	7,563	3,575	16,839
	USD sub-total	USD	62,242	113,040	77,570	252,852
Maintenance	for equip/office	MMK	411,147	1,989,156	1,161,390	3,561,693
Consumable	for OJT	MMK	10,940,510	23,139,123	20,945,243	55,024,876
Consumable	for Office	MMK	6,505,042	8,419,767	7,835,980	22,760,789
	MMK sub-total	MMK	17,856,699	33,548,046	29,942,613	81,347,358
Total in	(approx.)	USD	76,046	138,975	100,718	315,739
Total in	(approx.)	JPY	9,148,386	16,718,680	12,116,334	37,983,400

３－２　ミャンマー側投入実績

（1）C/P 配置

分　野	氏名/役職
Project Director	Mr. Aung Win（U Saw Valentine） / GM (Technical & Admin. Support)
Project Advisor	Mr. Saw Valentine, Advisor
Project Manager	Mr. Tin Soe/ GM (Civil)
Deputy Project Manager	Mr. Maung Maung Thwin /DGM (Civil)
HQ based C/P	Mr. Maung Maung Than / DGM (Civil)
Track Maintenance Contracting	
Bridge Maintenance	
Operation and Maintenance	Mr. Kyaw Kyaw My/ AGM (Operation)
Track Maintenance	Mr. Than Htay/ DGM (Civil) Mr. Tin Myint (U Maung Maung Than)/ AGM (Civil)
Procurement of Equipment and Material	Mr. Khin Maung Than (Win Htein) / DGM(Supply)
Signaling and Telecommunications	Mr. Khin Maung Thein/ DGM (S&T) (Mr. Myint Lwin/ AE (S&T), Mr. Han Nyunt/ AGM (S&T))
Rolling Stock	Mr. Win Oo/ GM (Rolling Stock) (Mr. San Myint/ Train Operation, Mr. Thet Lwin/ DGM (Rolling Stock)
Train Operation	Mr. Htay Myint Aung/ DGM (operation) (Mr. Zaw Pe Sein/ Divisional Traffic Manager)
Structure	Mr. Tin Win/ DGM (Civil)

注：（）書きはプロジェクトの途中で人事異動になった該当者を示す。

付属資料４：評価グリッド（評価結果）

SECTION I. Project Achievements

Evaluation Questions		Results
Main Questions	**Sub Questions**	
Prospect for Achieving the Overall Goal	To what degree has the Overall Goal been achieved? **Overall Goal:** Service and Safety Level of Myanma Railways is improved.	**OVI 1. Number of annual accidents on Yangon-Mandalay line decreases compared [from the base year of 2014/2015]** **Means of Verification: Statistics on safety** **OVI 2. Journey speed on Yangon-Mandalay line increases compared [from the base year of 2014/2015]** **Means of Verification: Statistics on operation** **OVI 3. Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation [of the base year of 2014/2015]** **Means of Verification: Statistics on operation** • Given the Project has placed MR on a positive course for safety and service improvement, there is good potential for the implementing agency to achieve Overall Goal in three to five years after the Project completion, the time set for Ex-Post Evaluation as per JICA rule. However, since to what extent pre-determined indicators are achieved will be measured only at that time, probability of satisfying these indicators cannot be determined at this stage.
Prospect for Achieving the Project Purpose	To what degree has the Project Purpose been achieved? **Project Purpose:** Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	**OVI 1: Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR.** ⇒ Achieved. **Means of Verification: * Reflection on organization, management/operation rules, facilities renewal plans** • Training program to guide MR staff to familiarize with techniques on cause of accident and low service level analysis and establishment of countermeasures was conducted from February 10 to 28 in 2014 at MR Headquarters, participated by 19 managerial level staff (drawn from track maintenance, civil works, signaling, rolling stock and train operation divisions) as well as MR HQ. • The training consisted of three parts: (1) classroom lecture with textbooks prepared by JICA experts; (2) workshop, (3) training of vibration measurement of rolling stock. • Following the training, interview survey to investigate customer satisfaction level of MR passengers was also conducted. ***Utilization, modification of administration management manuals** ⇒ Achieved. • The manuals have been referred mainly by Inspectors, who are tested for their knowledge every two years at MR HQ, and for such examinations have been consulting the manuals as necessary and appropriate. **OVI 2: Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR** ⇒ Achieved.

Evaluation Questions		Results
Main Questions	**Sub Questions**	
		<u>Means of Verification</u>: Actual results of maintenance execution, such as the record of maintenance • The interviews conducted at the Pilot Section with the Project trainees confirmed that the Project introduced track maintenance techniques (using Project provided equipment) and practices (such as visual check for safety, wearing of safety gears like helmet, safety boots, safety vest) have been rooted into the track maintenance routines of the staff trained.
Achievement levels of the Outputs	To what degree has Output 1 been achieved? **<u>Output 1</u>:** Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.	**OVI 1-1 System for collecting information of track, rolling stock, signal and communication, and operation is established.** ⇒ Achieved. **<u>Means of Verification</u>: 1-1 Related management document(s) of system for collecting information** • In order to collect relevant information, Project established Counterpart Team consisting of key managerial as well as technical members drawn from both Japanese and Myanmar side, structured in matching pairs. They are: Leader and Project Director, Deputy Leader and Project Manager, Railway Policy/Operations and Maintenance Improvement Expert and C/P, Track Maintenance Expert and C/P, Procurement of Equipment & Materials Expert and C/P, Signaling & Telecommunications Expert and C/P, Rolling Stock Expert and C/P, Train Operation Expert and C/P, and Structure Expert and C/P. These representatives played key role in collecting information on train operation and rolling stock, including two experts visiting MR Headquarters and three rolling stocks workshops for facts finding in August and September, 2013. In addition, based on responses on the questionnaire prepared by JICA Expert Team, "Present Situation of Safety and Service Level of MR" was compiled to guide further process for this Output. **OVI 1-2 Safety issues are listed based on the investigation and analysis of cause of accident** ⇒ Achieved. **<u>Means of Verification</u>: 1-2 Listed issues** • Project organized a workshop during the cause and analysis training conducted from Feb. 10-28, 2014, where 25 topics relating to accidents and low service levels (train delay and speed restrictions) were selected from actual MR events in 2012/2013. In the workshop, MR experts then analyzed the causes and presented appropriate countermeasures. **OVI 1-3 Service issues are listed.** ⇒ Achieved. **<u>Means of Verification</u>: 1-3 Listed issues** • Following the cause and analysis training (Feb. 10-28, 2014), Project conducted questionnaire survey on customer satisfaction to illustrate service issues. It was conducted on March 4-7, 2014 between Yangon Station and Nay Pyi Taw Station on Yangon-Mandalay Trunk Line, targeting MR passengers, except foreign travelers, based on interviews in the running trains. • Unfortunately, it was illuminated that general satisfaction level is very low. Yet, areas as well as level of dissatisfaction are clarified for improvement (such as riding comfortability, train speed, train delay, on time departure/arrival, cleanliness, seat comfortability, staff attitude, booking, waiting facility). **OVI 1-4 Service and safety improvement plan is drawn so as to tackle the issues** ⇒ Achieved. **<u>Means of Verification</u>: 1-4 Service and safety improvement plan**

Evaluation Questions		Results
Main Questions	**Sub Questions**	
		• Relevant technical standards in the field of civil, signal/telecommunications, operation, rolling stock engineering have been supplied by MR, and preparation of recommendations started in the first year of Project implementation. Subsequently, the gist was compiled into "Report of Proposals," which was then discussed among the Project concerned people, and "Summary of Discussion in the Workshop for Recommendations on Technical Standards and for Drawing up Short- (2015-18), Medium- (2018-25), and Long-Term (2025-2045) Railway Facilities Improvement Plan" was prepared. After reviews, "Revised Report of Proposal of Recommendation on Technical Standards of MR and Short-, Medium-, and Long-Term Railway Facilities Improvement Plan" was prepared and presented at "Summarizing Workshop" on December 15-19, 2014.
Achievement levels of the Outputs	To what degree has Output 2 been achieved? **Output 2:** Technical capability is improved through emergency track maintenance to improve the level of service and safety.	**OVI 2-1. Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons).** ⇒ Achieved. **Means of Verification: 2-1 Record of technical transfers** • The prevailing track maintenance work in Myanmar prior to the Project was based on an old-fashioned, more manual system implemented in Japan in the past. Through the Project, track maintenance inspectors and workers of MR received education/training on basic mechanized maintenance system using large-scale maintenance machines. • In the 46.5 mile section (74.8km long) between Yangon and Bago on Yangon-Mandalay line, track maintenance as a means of technical transfer in the approximately 20km Pilot Section was selected through a site survey to allow experiencing maintenance of different track structures, such as defective, sound, straight and curved tracks, turnouts in station yards and bridges. Project then conducted comprehensive training program for a batch of 30 trainees from the end of October, 2013 to mid-May, 2014. • The sequence of technical transfer was as follows: based on assessment of the level of track maintenance technologies of MR employees and compilation of appropriate text books, JICA experts held seminars on improvement of track maintenance technologies (targeting 20 or so participants) in three steps: (1) at the start of track maintenance OJT, (2) after the completion of maintenance, and (3) at the final summarization of OJT. • For the effectiveness of training, at the end of March, 2014, MR requested the Project to also include Davon University Line and Thilawa Branch Line at Toekyaungkalay Station as Pilot Section work. The Project utilized this enlargement of the scope of Pilot Section as an opportunity to provide training to more staff, by re-programming the contents and timing to fit into one month program. The graduates of the training have since returned to their duty stations to apply obtained techniques. • With regard to the additional activity lines scheduled for follow-up period, namely, (1) lecture series were organized on outsourcing track maintenance, including sharing of Japanese experiences, and (2) seminar and training courses were offered on bridge maintenance in phases. **OVI 2-2. Working manual of emergency track maintenance is prepared.** ⇒ Achieved. **Means of Verification: 2-2 Set of working manual** ① Safe Work Manual ② Track Work Manual ③ Measurement for Track Manual • Japanese experts summarized the points of reflection through the whole maintenance work and compiled the maintenance manuals (English and Burmese) to meet the present status of the track maintenance in Myanmar in consideration of the local organization, working conditions and climates. While compilation activity was led by the Japanese Experts, C/P participated in review process toward finalization.

Evaluation Questions		Results
Main Questions	Sub Questions	
		OVI 2-3. Proper equipment and materials are procured both qualitatively and quantitatively. ⇒ Achieved. **Means of Verification: 2-3 Inventory list of equipment and materials** • Equipment and materials were selected based on careful analysis of the prevailing situations/conditions, which in other words included procurement of equipment no longer in use in Japan, requiring extra time to obtain. Such process led to late procurement of some materials, but ensured appropriateness with Myanmar context. **OVI 2-4. Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others.** ⇒ Achieved. **Means of Verification: 2-4 Record of seminar and training** • Three combined cycles of (1) seminars and (2) training have been conducted. Each cycle consists of (1) introduction of particulars related to track maintenance such as inspection, planning and work for the workers in classroom setting, followed by practical training on track maintenance (inspection and work) on yard tracks wearing safety gears (such as protective shoes, helmets and safety vests), and (2) actual work on Pilot Section (October 2013, December 2013, and February, 2015). Aside, regular induction was provided throughout Project period to new inspectors. In addition, final wrap up seminar is being scheduled to take place in the first week of February, 2016 to ensure the trainees can have an opportunity to reflect and solve any questions hanging in their minds before the completion of the Project.
Achievement of Inputs	Have the Japanese side's inputs been allocated as planned?	• **Personnel (Japanese the JICA Expert Team):** The Japanese side has assigned 79M/M (inclusive of 8.52M/M supported by non-JICA budget) performed by cumulative total of 27 Experts to the Project. (See Annex 3-1-1 Assignment of the JICA Expert Team). • **Training in Japan** The Japanese side has provided training in Japan to managerial and technical staff members from Myanma Railways (totaling 33 members) over the course of three separate training: (1) June 8-21, 2014 (track maintenance for 11 participants), (2) June 22-July 5, 2014 (track maintenance for 11 participants), and (3) October 19-November 1, 2014 (railway institutional management improvement for 11 participants). (See Annex 3-1-3 Training in Japan). • **Provision of equipment and materials:** The Japanese side has provided equipment necessary for the implementation of the Project, which amounted to Japanese Yen (JPY) 62 million (Approximately USD 0.52 million) (See Annex 3-1-4 Provision of Machinery and Equipment). • **Operational Expenses:** The Japanese side has allocated the total amount of USD 315,739 equivalent (JPY 37,983,400) for the operational costs of project activities (see Annex 3-1-4 "Operational Expenses by Japanese Side").
	Have the Myanmar side's inputs been allocated as planned?	• **Counterpart personnel:** The Myanmar side has assigned Project Director, Project Manager, and C/P in the cumulative total of 19 personnel, drawn from Myanma Railways (MR) who constituted Counterpart Team, (See Annex 3-2-1 Assignment of C/P Personnel).

Evaluation Questions		Results
Main Questions	Sub Questions	
		• **Facilities:** The Myanmar side has provided office space for JICA Expert Team as well as temporary dormitory facility for trainees. • **Local cost:** • The Myanmar side has covered necessary operational costs of Project activities including expenses for Pilot Site work and materials and C/P travel.

SECTION II. Implementation Process

Evaluation Questions		Results
Main Questions	Sub Questions	
Implementation of Activities and Ownership in Implementation	To what degree have project activities been implemented as planned? Has the implementation agency (i.e. Myanma Railways) demonstrated an adequate level of ownership to enhance their management capacity?	• The planned activities have been fully implemented based on detailed sequential procedures proposed by Japanese Experts, consulted with Myanmar side, and as appropriate refined by consensus. • For effective implementation, the Project established "Working Group for Service and Safety Improvement" consisting of key managerial as well as technical members drawn from both Japanese and Myanmar side, structured in matching pairs. They are: Leader and Project Director, Deputy Leader and Project Manager, Railway Policy/Operations and Maintenance Improvement Expert and C/P, Track Maintenance Expert and C/P, Procurement of Equipment & Materials Expert and C/P, Signaling & Telecommunications Expert and C/P, Rolling Stock Expert and C/P, Train Operation Expert and C/P, and Structure Expert and C/P. • "During implementation, several experts located at MR HQ were added to C/P Team, so that the analysis of accidents, low service level and discussion of countermeasures could be effectively executed…." (Progress Report March 2015, p. 42) This is a positive example of the ownership presented and performed by the implementing agency.
Project management	Are there any issues with the project management? Has there been an effective communication and information sharing among CP and between CP and Experts?	• The Experts made an emphasis on regular communication with the MR management, through weekly reporting to GM in charge of Lower Myanmar Administration, for example. However, particularly since Project site was centered on Yangon area while MR Headquarters is located in Naypyidaw, seamless communication was a bit of a challenge. • Typically JICA Project holds JCC meeting on a biannual basis, and this Project adopted such interval initially. By positive proposal by Myanmar side, however, it was changed to be held on quarterly basis. While this change put pressure on the Project for preparation, the higher frequency supported more intimate communication among the JCC members and therefore for the Project.

SECTION III: Evaluation by the Five Criteria

	Evaluation Questions		Results
	Main Questions	**Sub Questions**	
Relevance	Relevance with the Government policy of Myanmar	Has the Project been in line with the priority of development policies of the Government of Myanmar as well as vision, principles, and strategic plan of Myanmar Railways?	• "The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services (p. 9-27). It points out, however, that the quality of railway transport services, in terms of speed and accident control, is low mainly because of deteriorated track conditions and aged and poorly maintained passenger coaches and freight wagons, underlining the relevance of the Project with the country's current priority for the sector.
	Relevance with the needs of beneficiaries	Has the Project Purpose been in line with the needs of the target group? Have the needs of the target group been high? **Target Group:** [had not been defined. By discussion with Expert Team, it was confirmed that Myanma Railways' civil engineers" were essentially the target of the Project activities.	• Based on MR's recognition of the effectiveness of the Project, the target number of staff for technical transfer was increased upon request by MR, from the original number of 30 trainees to over 500 (at the time of the terminal evaluation in January 2016). Pilot Section coverage was also enlarged upon request to include Davon University Line and Thilawa Branch Line centering Toekyaungkalay Station area. These enlarged scope of the Project is the testament of relevance of the Project with the needs of the implementing agency to serve the end beneficiaries – customers - better. Given the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance.
	Relevance with the Japan's ODA Policy	Has the Project been in line with the Japanese Government' s assistance policies for Myanmar?	• Project was a direct response to "Japan's Assistance to Myanmar" (i.e. Japan's economic cooperation policy publicized on April 21, 2012) that highlights issues of operational improvement and modernization of the country's railways as a part of "infrastructure to promote economic development" and "development of infrastructure and related system necessary for the sustainable economic development." This economic cooperation policy is still current, endorsing the relevance of the Project.
	Comparative empirical and technological advantage of Japan's cooperation	Do you see Japan has clear technological and empirical advantages?	• Japan's own experiences in re-establishing the railway sector post WWII from the devastated state of significant loss of infrastructure and know-hows (such as loss of drawings) has enabled its technical cooperation to contextualize with the sectoral environment in which Myanmar is situated, who is pursuing to upgrade to mechanized system. Moreover, areas such as attention to details in equipment management and high safety standard are trademarks of Japanese railway sector, giving Japanese support an unparalleled position in the international assistance to the sector.
Effectiveness	Achievement of the Project Purpose	What is the prospect of achieving the Project Purpose by the end of the Project period?	• Refer to Section I: Project Achievements

	Evaluation Questions		Results
	Main Questions	**Sub Questions**	
Effectiveness	**<u>Project Purpose:</u>** Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	To what degree was the achievement of the Project Purpose attributable to the successful achievement of the Outputs?	• The achievement of the Project was derived by a balanced combination of Myanmar appropriate equipment and machinery brought from Japan, and the Japanese Experts who had high level of not only technical expertise but also compassionate characters. • As Project Director noted in the Terminal Evaluation interview, this Project was one of the kind MR had never experienced, and thus the results are directly attributable to the Project.
		Have the Important Assumptions for achieving the Project Purpose been fulfilled?	**<u>Important Assumptions</u>** • Administration staff members are not relocated drastically. • Technical staff members are not relocated drastically.
	Contributing factors	To what degree has each Output been produced?	• See Section 1: Project Achievement
		Have there been any other factors that contributed to the achievement of the Project Purpose?	• Donation of rails by a Japanese steel manufacture to be installed on Yangon and Mandalay line provided the Project an opportunity to check their more technology oriented skills built through the Project.
	Hindering factors to Effectiveness	Have there been any other factors that impeded the achievement of the Project Purpose?	• Equipment and materials were selected based on careful analysis of the prevailing situations/conditions, which in other words included procurement of equipment no longer in use in Japan, requiring extra time to obtain. Such process led to delay in procurement of some materials for a few months. Japanese Experts responded to the situation by modifying schedule and content of technical transfer.
Efficiency	Causality of Inputs and Outputs	Have Project activities been appropriately conducted in terms of their timing, duration, and quality to produce planned Outputs?	• The scope and type of technical transfer (i.e. mechanized track maintenance) was new to the C/P, and without the Project would not have been introduced to MR. For that matter, there was direct cause and effect relationship between Project inputs and outputs.
	Achievement of Outputs	Has the Important Assumption for achieving the Outputs been fulfilled?	**<u>Important Assumptions:</u>** • The Government support to the Myanma Railways, especially financial support is secured
	Appropriateness of Inputs by Japan	How appropriate has the assignment of Experts been in terms of the number of experts, their expertise and capabilities, and the dispatched periods and timings?	• "To implement the Project more smoothly, some JICA track experts were added to the original JICA experts" (Progress Report, p. 41) • Experts were valued by C/P as not only knowledgeable on the technical matters but also approachable.
		How appropriate has CP training in Japan and in the third countries (if applicable) been in terms of the number of participants, training contents, and the dispatched period and its timing?	• Eye-opening (Ms. Daw Khim May Than), e.g. signaling system, pension system, safety door • If not all, some track technologies are applicable in Myanmar, and thus it was enlightening experience.

	Evaluation Questions		Results
	Main Questions	Sub Questions	
Efficiency		How appropriate has the provision of equipment by the Japanese side been in terms of its quality, quantity and timing?	• With regard to some of the equipment and machinery selected for the suitability for MR were no longer readily available in the Japanese market, and required additional time to import into the country. The demand for and evaluation on the Project introduced Japanese equipment was extremely high among C/P, expressed at the time of Terminal Evaluation interviews. These comments included practicality of hand tie pampers (so much easier to handle than the huge counterpart machines traditionally available in Myanma) and prevision of vibration measuring equipment. All in all, exposure to new type of equipment through the Project put the work of C/P a level higher toward more mechanized maintenance operation.
	Appropriateness of Inputs by the Myanmar side	How appropriate has the assignment of CP been in terms of the number, placement (i.e. balance between their regular tasks and Project activities) ownership and level of participation?	• Myanmar side also made the effort in securing resources to support the Project activities. It included expenses for the Pilot Site work and materials and C/P travel.
		How appropriate has the provision of facilities and equipment by the Myanmar side been?	• Myanmar side provided temporary housing for the trainees.
		Has the budget for the Project been appropriate in scale?	• See Section 1: Project Achievement
	Cooperation with other organizations/ projects	Has there been any effective cooperation with other organizations or projects that increased the efficiency of the Project?	• See Impact Section
	Contributing or hindering factors to Efficiency	Are there any other factors that increased or decreased the efficiency of the Project?	
Impact	Prospects of achieving the Overall Goals	To what degree has the Overall Goal been achieved? **<u>Overall Goal:</u>** Service and safety level of Myanma Railways is improved.	• See Section 1: Project Achievement

	Evaluation Questions		Results
	Main Questions	Sub Questions	
Impact		Will the Overall Goal be achieved in 3 to 5 years after the completion of the Project? (Are the Overall Goal and verifiable indicators still valid?)	**Means of Verification:** Statistics on safety, Reporting of accident cause analysis and discussion of countermeasures are executed, Statistics on operation, Interview/questionnaire to clients • Given the Project has placed MR on a positive course for safety and service improvement and their commitment was evidenced during the Terminal Evaluation, there is potential for the implementing agency to achieve Overall Goal in three to five years after the Project completion, the time set for Ex-Post Evaluation as per JICA rule. However, since to what extent the pre-determined indicators will have been achieved will be measured only at that time, probability of satisfying these indicators is uncertain at this stage.
		Have the Important Assumptions for achieving the Overall Goals been fulfilled?	**Important Assumption:** Yes • Administration staff members are not relocated drastically • Technical staff members are not relocated drastically
	Other aspects	Are there any unexpected positive and negative impacts?	
Sustainability	Institutional aspect	Would relevant national/sectoral policies seem to support the Project produced Outputs after its completion?	• "The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted in January 2016 by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services (p. 9-27). For the connectivity MR provides both for citizens (passenger service) and business (freight service) for the country's national development, priority entrusted on to MR is expected to continue.
	Organizational aspect	Has an organizational mechanism for continuous improvement to deliver Project Outputs established?	• One positive push factor for the organization is the recent enactment of New Railway Act (January 2016). Which it will require MR to review and furnish new rules and regulations for which Project prepared manuals and documents can provide good starting references, as per the comment of MR Manager. This is one area where MR can be motivated to bring forward experiences they accumulated with the Project. • To ensure the Project will affect on the organization more broadly on its sustainability, review of organizational structure of MR to see house a unit that will oversee the safety issues across divisions. This time the Project worked Civil Division mostly, but going forward, mainstreaming safety as an organizational agenda will be make MR a more effective organization.
	Financial aspect	Have the Project concerned organizations been able to secure sufficient budget to conduct its operation and management?	• As a monopolized state-owned transport enterprise, Myanma Railways has maintained its operation under deficit as the sole critical mass transit mode for the country. This operation mode is considered to continue in the coming years, and it will be an institutional judgement and decision as to how much/less to resource the organization. However, as discussed multiple times in this report, national importance is attached to MR, and thus, its status as on-going concern is not doubted. Yet, MR always faces competition with other modes of transport, attention to and prioritization on financial soundness will definitely help the organization's footing in the society.

	Evaluation Questions		Results
	Main Questions	**Sub Questions**	
Sustainability	Technical aspect	Have core staff of the Project concerned organizations been trained sufficiently in number and knowledge to conduct its operation and management based on the annual plans developed by the Project?	• The graduates of the training have since returned to their duty stations to apply obtained techniques. This increase led the Project to provide the training to over 500 (by the time of the Terminal Evaluation in January 2016). Given the total number of civil staff at MR is around 4,000, the Project essentially affect 13% of its workforce engaged with track maintenance. • Project arranged additional equipment for the increased scope and coverage of the trainees. Allocation of such equipment to accompany the trainees is critical for them to continue the changed practice of maintenance, the one more mechanized. Thus, it will be important for the Project to complete the equipment allocation before the closure.
	Other factors that will affect the sustainability of the Project achievements	Are there any other factors that will increase or decrease the sustainability of the Project?	

付属資料５：プロジェクト・デザイン・マトリックス（PDMe）

Project Title: The Project on Improvement of Service and Safety of Railway in the Republic of the Union of Myanmar	Period of Project: May 2013 - March 2016
Implementing Agency: Myanma Railways (MR), Ministry of Rail Transportation	
Project Site: Yangon	

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
[Overall Goal] Service and safety level of Myanma Railways is improved	① Number of annual accidents on Yangon-Mandalay line decreases [from the base year of 2014/2015] ② Journey speed on Yangon-Mandalay line increases compared [from the base year of 2014/2015] ③ Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation [of the base year of 2014/2015]	* Statistics on safety * Statistics on operation * Statistics on operation	
[Project Purpose] Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	① Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR. ② Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR	* Reflection on organization, management/operation rules, facilities renewal plans * Utilization, modification of administration management manuals * Actual results of maintenance execution, such as the record of maintenance	* Administration staff members are not relocated drastically * Technical staff members are not relocated drastically
[Output] 1. Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn. 2. Technical capability is improved through emergency track maintenance to improve the level of service and safety	1-1 System for collecting information of track, rolling stock, signal and communication, and operation is established. 1-2 Safety issues are listed based on the investigation and analysis of cause of accident 1-3 Service issues are listed 1-4 Service and safety improvement plan is drawn so as to tackle the issues 2-1 Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons) courses. 2-2 Working manual of emergency track maintenance is prepared. 2-3 Proper equipment and materials are procured both qualitatively and quantitatively 2-4 Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others	1-1 Related management document(s) of system for collecting information Project progress reports 1-2 Listed issues 1-3 Listed issues 1-4 Service and safety improvement plan 2-1 Record of technical transfers 2-2 Set of working manual 2-3 Inventory list of equipment and materials 2-4 Record of seminar and training	* The Government support to the Myanma Railways, especially financial support is secured

Activities	Inputs		
1-1 To conduct current situation survey regarding track, rolling stock, signal and communication, and operation, and establish system for collecting information. 1-2 To promote familiarization on the investigation and analysis method of accident cause based on the comprehensive factors of track, rolling stock, signal and communication, and operation. 1-3 To conduct the investigation and analysis mentioned above. 1-4 To provide recommendation based on above analysis on necessary technical standards to improve service and safety level. 1-5 To draw the improvement plan of railway facilities through discussion with the "Working Group for Service and Safety Improvement (tentative name)." 2-1 To draw the technology transfer plan. 2-2 To procure the necessary equipment and materials. 2-3 To conduct emergency track maintenance. 2-4 To summarize betterment point(s) obtained during emergency track maintenance operation, and to feedback to the successive measures. 2-5 To draw the working manual of emergency track maintenance. 2-6 To conduct seminars, training for technical improvement on the rail maintenance and others.	[Japanese Side] 1. Dispatch of Japanese Experts Fields of Experts (several persons) * Railway OM improvement * Technical Standards * Track Maintenance * Procurement of Equipment and Materials/Project Coordination 2. Counterpart Training in Japan * Railway Institutional Management Improvement: 11 persons x 2 weeks * Track Maintenance: 22 persons x 2 weeks 3. Equipment Necessary handy equipment of emergency track maintenance, such as Tie Tamper 4. Expense For research, travel, training, the other activities for Japanese Experts	[Myanmar Side] 1. Assignment of Counterpart * Project Director: 1 person * Project Manager: 1 person * Railway Policy/OM Improvement: 1 person * Rail Maintenance: 1 person * Procurement of Equipment and Materials: 1 person * Others: as appropriate 2. Provision of facilities for Project implementation * Project office (in the Myanma Railways, Lower Myanma Regional Office) * Working tools and furniture for Project Office * Internet connection in the Project Office 3. Joint Coordinating Committee (JCC) * Establishment of JCC 4. Expense * Local cost for personnel * Cost for office rent and equipment * Expense for the pilot project, such as gravels, sleepers, rail materials and others * Other expenses: For research, travel, training, the other activities for counterpart personnel 5. Others * Status guarantees of Japanese Experts, ID card for access into the Myanma Railways properties * Access to the necessary statistical data and related information * Other necessary local cost	[Pre-conditions] • Natural disaster does not hit the railway facility

Joint Terminal Evaluation Report

on

The Project on Improvement of Service and Safety of Railway in the Republic of the Union of Myanmar

January 29, 2016

List of Abbreviations and Acronyms

Abbreviation	Official Name
C/P	Counterpart Personnel
HQ	Headquarters
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
M/M	Minutes of Meeting
MR	Myanma Railways
OJT	On the Job Training
OVI	Objectively Verifiable Indicator
PDM	Project Design Matrix
PO	Plan of Operations
R/D	Record of Discussion

Exchange Rate

USD1 = JPY120.3

MMK1 = JPY0.093

(JICA rate for January, 2016)

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1. Introduction

1-1. Background and Purpose of the Evaluation

1-1-1. Background of the Evaluation

The Project on Improvement of Service and Safety of Railway in the Republic of the Union of Myanmar (the "Project") is a technical cooperation with the aim of enhancing service and safety of Myanma Railways ("MR") through improvement in the ability to administer and maintain train operation.

In response to the request from the Government of the Republic of the Union of Myanmar, the Japan International Cooperation Agency ("JICA") dispatched a Detailed Planning Survey Team in October 2012 and concluded an agreement on cooperation framework, whose details were documented in Record of Discussions ("R/D") signed on March 28, 2013. Based on the signed R/D, the Project was launched in May 2013 with MR as Implementing Agency.

Close to the end of the original Project period (May 2015), a request for extension was submitted by the authorities concerned of the Myanmar Government. The objective specified was to incorporate the following scope into the Project in order to fully capitalize Project efforts thus far for the objective of supporting modernization of MR:

(1) To continue training on track maintenance of the Yangon-Mandalay line including Thilawa line;

(2) To conduct lecture(s) on Japanese experiences in the procedure of outsourcing of track maintenance;

(3) To conduct lecture(s) on outline of bridge maintenance.

As per Minutes of Meeting ("M/M") signed on April 6, 2015, the stated activities were approved by both sides, the authorities concerned with the Government of Myanmar and JICA, to be conducted within the existing framework of the Project with the close of the Project extended to March 2016.

Prior to the extended Project completion in March 2016, as per the aforementioned R/D, followed by the Project extension M/M signed by both governments, the Terminal Evaluation of the Project was conducted by the Joint Terminal Evaluation Team ("the Terminal Evaluation Team"), comprised of representatives from both sides, with the objective of assessing and confirming Project's performance and effects, as well as drawing lessons for similar future activities.

1-1-2. Purpose of the Evaluation

The purposes of the evaluation are as follows:

(1) To confirm the achievement levels of Inputs and Outputs and the prospect for the Project Purpose to be achieved by the end of the project period, and the Overall Goals within three to

five years after the project completion, based on the Project Design Matrix for Terminal Evaluation ("PDM_e") (see Annex 5);

(2) To identify factors or issues that have promoted or hindered the implementation of project activities;

(3) To conduct a comprehensive evaluation from the viewpoints of five evaluation criteria; Relevance, Effectiveness, Efficiency, Impact and Sustainability (see 2-2 "Criteria of the Joint Terminal Evaluation" for their definitions);

(4) To draw recommendations of the measures to be taken for the Project's further improvement and identify lessons learned to be referred to by similar JICA projects; and

(5) To discuss and agree on the direction of the Project and prepare a joint terminal evaluation report based on the results of the discussions.

1-1-3. Members and Schedule of the Evaluation

(1) Members of the Evaluation

The members of the Terminal Evaluation Team are as follows:

1) Japanese Side

Name	Title	Position/Organization
Ms. Satoko Tanaka	Leader	Director, Team 2 Transportation and ICT Group, Infrastructure and Peace Building Department Japan International Cooperation Agency
Mr. Yusuke Taguchi	Evaluation Management	Team 2, Transportation and ICT Group, Infrastructure and Peace Building Department Japan International Cooperation Agency
Dr. Maki Tsumagari	Evaluation and Analysis	Partner, IMG Inc.

2) Myanmar Side

Name	Title	Position/Organization
Mr. Aung Win	Project Director	General Manager (Technical & Admin), Myanma Railways
Mr. Tin Soe	Project Manager	General Manager (Civil), Myanma Railways
Mr. Maung Maung Thwin	Deputy Project Manager	Deputy General Manager (Civil), Myanma Railways

(2) Schedule of the Evaluation

The Evaluation was conducted from January 18th to 29th, 2016 (see Annex 1 for the Evaluation

Schedule).

1-2. Outline of the Project

1-2-1 Background of the Project

The Republic of the Union of Myanmar has a totally non-electrified meter-gauge railway network spreading as long as 5,934 km. Most of the network is single-tracked, with double-tracked sections limited to (1) the Yangon-Mandalay section (approximately 620km in length) crossing the central plain and (2) urban railway lines centering on the Yangon circular section. The annual number of passengers was 53.8 million (or approximately 147,000 per day) as of fiscal 2012. The MR under the Ministry of Rail Transportation as fully stated owned enterprise centralizes all aspects of its management, from construction, operation, and maintenance.

In recent years, MR and Ministry of Rail Transportation have come to recognize the importance of maintenance/repair of existing lines in reflection of past practices. In the past, MR invested more than half of the budget in the construction of new railway lines, with only a small portion appropriated for the renewal of existing facilities and equipment. As a result, MR has been facing crucial challenges on how to recover the deteriorated safety level and passenger services. Those phenomenon resulted in the occurrence of 118 accidents for 2011/2012 in Yangon-Mandalay section, whose causes are attributable to tracks (50%), rolling stock (29%) and others (21%) respectively.

In relation to the level of service, a number of governing factors are required to be addressed, including train speed, punctuality, comfort (ride comfort, cleanliness in the passenger room) and fare and charge. The scheduled speed between Yangon and Mandalay is as low as 39km/h, with train speed limited at various points. The on-time operation rate of express passenger trains in the same section is as low as 41% for the consecutive three years. Furthermore, 59% of the services were delayed for improper track conditions and 22% by malfunction of rolling stock. This means that train delay is caused mostly by deteriorated tracks that also produce severe train vibration.

Such background led to the planning and implementation of the Project as described in 1-1-1 Background of the Evaluation.

1-2-2 Summary of the Project

Overall Goal	Service and safety level of Myanma Railways is improved.
Project Purpose	Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.
Project Outputs	1. Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn

	Training for target group is effectively provided. 2. Technical capability is improved through emergency track maintenance to improve the level of service and safety.
Project Period	From May 2013 to March 2016 (Two years and 11 months)
Implementing Agency	Myanma Railways (MR), Ministry of Rail Transportation

1-2-3 Changes Made in the Project Design Matrix (PDM)

From the original PDM attached to the Record of Discussion (R/D) (signed on March 28 2013), two reviews for revision were conducted to most effectively and efficiently capture Project performance as summarized below:

Summary of PDM Modifications

Narrative Summary	**Objectively Verifiable Indicators**		
	PDM_{ver1}	**PDM_{ver2}**	**PDM_e**
	R/D (March 2013)	**Inception Report (August 2013)**	**Terminal Evaluation (January 2016)**
Overall Goal			
Service and safety level of Myanma Railways is improved	① Number of annual accidents on Yangon-Mandalay line decreased 20% from 2011-2012's 118 cases	① Number of annual accidents on Yangon-Mandalay line decreases compared with the present and past records	[no change]
	② Average sanction speed on Yangon-Mandalay line increased 10% from 2011-2012 average (number of 2011-2012 average sanction speed to be set later)	② Number of speed restricted locations on Yangon-Mandalay line decreases compared with their present number	[dropped]
		③ Journey speed on Yangon-Mandalay line increases compared with the present journey speed	[no change]
		④ Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation	[no change]

	③ Satisfaction level of clients is enhanced	⑤ Satisfaction level of clients is enhanced	[dropped]
		⑥ Number of passenger	[dropped]
Project Purpose			
Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways	① Necessary administration management tools are provided	① Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR	[no change]
	② Responsible person (at least one) and practical staff members (at least five) capacity of management is enhanced	② Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR	[no change]

(1) Original PDM (PDM_{ver1}) to Modified PDM (PDM_{ver2})

From the original PDM attached to the Record of Discussion (R/D) (signed on March 28 2013), first modifications were made at the time of Inception Report submission (August, 2013). With regard to the Overall Goal, the below considerations led to the modifications[1] in order to address challenges associated with quantification of the adopted indicators given the environment of the Project:

- Number of annual accidents: Because (a) the Pilot Section is rather short, only 20km, accordingly, rehabilitation of track is limited in length, (b) the rehabilitation/modernization of various railway facilities on the Yangon-Mandalay line is not made clear, accordingly, it may be difficult to show how much [of] the accidents caused by the deteriorated railway facilities can be reduced, and (c) number of accidents fluctuates considerably year to year mainly due to weather conditions, quantitative expression for reduction of accidents [was determined more appropriate to be] avoided.
- Reduction of number of limited speed locations, improvement of journey speed, and improvement of punctuality of train operation: Without the modernization of signaling systems, it may be difficult to raise the train speed, while ensuring the train operation safety. Accordingly, “reduction of number of limited speed locations,” improvement of journey

[1] Refer to Project Progress Report (2014), Appendix.

speed" and "improvement of punctuality of train operation" were adopted, [while] quantitative expressions were avoided.

For Project Purpose, wording for the indicators were reviewed to add clarity and specificity.

(2) Modified PDM (PDM_{ver2}) to Evaluation PDM (PDM_e)

During discussion of the Terminal Evaluation, it was proposed to streamline the indicators for the Overall Goal, as these are the targets to be monitored by the implementing agency itself for attainment in three to five years after the Project completion, and thus it is not preferred to require excessive efforts for data accumulation along the way. Rather, it will be best if the data can be accumulated as a part of normal operation of the rail service. With this thinking, in order to adequately capture the two dimensions of the Project focus, service and safety, indicators that measure "number of "accidents" (safety focus), "journey speed" (both safety and service in mind), and "punctuality" (service) were kept, while two other indicators that measure "speed" dimension were dropped along with "number of "passenger" indicator whose validity is questioned without comparing the trend over time by other mode of transport services to which customers have access.

2. Methodology of the Evaluation

2-1. Framework

In accordance with the *New JICA Guidelines for Project Evaluation* (the First Edition, 2010), the Terminal Evaluation Team evaluated the Project, taking the following steps:

Step 1. Prepare an evaluation grid that lists evaluation questions, data/information necessary for evaluation and information sources;

Step 2. Collect data and information necessary for the evaluation;

Step 3. Assess the Project's achievements in reference to the PDM_e;

Step 4. Analyze the factors that promoted or inhibited the Project's achievements, including factors relating to the project design and the project implementation process.

Step 5. Analyze the Project from the viewpoints of five evaluation criteria, defined in 2-2 "Criteria of the Joint Terminal Evaluation";

Step 6. Draw recommendations from the analysis;

Step 7. Share the preliminary evaluation results with stakeholders and discuss the future directions of the Project; and

Step 8. Reach an agreement on the evaluation results between the Japanese and Myanmar sides.

2-2. Criteria of the Evaluation

Five evaluation criteria used in the evaluation are defined as follows:

Relevance	Relevance is assessed in terms of the Project's validity in relation to the Government policy of Myanmar, strategic plan for rail sub-sector, Japan's Official Development Assistance (ODA) policy, and the needs of the Project beneficiaries, as well as the appropriateness of the project approach to address the needs.
Effectiveness	Effectiveness is assessed based on the prospect of achieving the Project Purpose by the end of the project period and whether this is due to the Project's Outputs.
Efficiency	Efficiency is assessed by focusing on the relationship between Outputs and Inputs in terms of timing, quality and quantity of Inputs. It measures to what extent Project Inputs have economically been converted into Outputs in consideration of the achievements of both Inputs and Outputs.
Impact	Impact is assessed based on the prospect of achieving the Overall Goals within three to five years of the project completion and the positive and negative changes to be produced, directly or indirectly as a result of project implementation.

Sustainability	Sustainability is assessed in terms of institutional, organizational, financial and technical aspects, by examining the extent to which the achievements of the Project will be maintained or further expanded by the Myanmar side after the project period.

2-3. Evaluation Grid and Data Collection Methods

(1) Evaluation Grid

The Team evaluated the Project based on the evaluation questions listed in the evaluation grid (see Annex 4 for the list of evaluation questions and evaluation results of the questions.). The evaluation grid is comprised of three sections: (1) Project achievements; (2) Implementation Process; and (3) Evaluation by the Five Criteria.

(2) Data Collection Methods

The following sources of information and data were used in the joint terminal evaluation:

1) Interviews with the Project's Japanese Expert ("Expert"), Counterpart Personnel ("C/P"), and other people concerned with the Project (see Annex 2 "List of Interviewees");
2) Documents agreed upon by both sides prior to and/or during the course of the Project implementation;
3) Records of inputs from both sides and activities of the Project (see Annex 3 "Inputs") ;
4) Project Site inspection;
5) Documents that provide data and information indicating the degree of achievements of the Project Outputs, Project Purpose, and Overall Goal, and
6) Policy documents that show the project's relevance and sustainability.

3. Performance and Implementation Process of the Project

3-1. Performance of the Project

3-1-1 Inputs

(1) Japanese Side

The Japanese side provided the following inputs to the Project (see Annex 3-1 “Inputs by the Japanese Side” for details.).

1) Assignment of Experts

The Japanese side has assigned 79 Man/Month (“M/M”) (inclusive of 8.52 M/M supported by an additional contribution proposed by the dispatch company of the Japanese Experts, i.e., non-JICA budget) performed by cumulative total of 27 Experts to the Project. The expertise and assigned periods of Experts are the following. (see Annex 3-1-1 “Assignment of Experts”).

Table 1. Expertise and Assigned Period of Experts

Expertise	Number (Person)	Assigned period (M/M)	Out of which Non-JICA budget (M/M)
Leader/Railway Operation and Maintenance Improvement	1	4.83	
Leader/Railway Operation and Maintenance Improvement・Maintenance Planning	1	5.66	
Deputy Leader / Maintenance Planning	1	13.17	
Deputy Leader / Bridge Maintenance	1	2.96	
Operation and Maintenance	1	24.96	
Procurement of Equipment and Material	3	2.10	
Signaling and Telecommunications Expert	2	1.80	
Rolling Stock Expert	1	2.50	
Track maintenance (1)	4	10.33	
Track maintenance (road bed)	2	1.57	
Operation expert	2	1.80	1.80
Project coordinator	1	3.13	3.13
Track maintenance (2)	2	2.06	1.86
Track maintenance (3)	2	0.70	0.50
Track maintenance (4)	2	1.43	1.23
Track maintenance (5)	1	0.00	
Total	27	79.00	8.52

Note: Covers up to January 2016

2) Training in Japan

The Japanese side has provided training in Japan to 33 managerial as well as technical staff members from MR over the course of three separate training: (1) June 8-21, 2014 (track maintenance for 11 participants), (2) June 22-July 5, 2014 (track maintenance for 11 participants), and (3) October 19-November 1, 2014 (railway institutional management improvement for 11 participants). (see Annex 3-1-2 “Training in Japan”).

3) Provision of Equipment and Materials

The Japanese side has provided equipment and materials required for the effective implementation of the Project, which amounted to Japanese Yen (JPY) 62 million (Approximately USD 0.52 million) (see Annex 3-1-3 “Provision of Equipment and Materials”).

4) Operational Expenses by Japanese Side

The Japanese side has allocated the total amount of USD 315,739 equivalent (JPY 37,983,400) for the operational costs of project activities (see Annex 3-1-4 “Operational Expenses by Japanese Side”).

(2) Myanmar Side

The Myanmar side has provided the following inputs to the Project. (see Annex 3-2 “Inputs by the Myanmar Side” for details).

1) Assignment of C/Ps

The Myanmar side has assigned Project Director, Project Manager, and C/P in the cumulative total of 19 personnel, drawn from MR who constituted Counterpart Team (See Annex 3-2-1 “Assignment of C/P Personnel”).

2) Facilities

The Myanmar side has provided office space for JICA Expert Team as agreed by R/D. In addition, the Myanmar side provided temporary dormitory facility for the trainees.

3) Local Cost

The Myanmar side has covered necessary operational costs of Project activities including expenses for Pilot Site work and materials, and C/P travel.

3-1-2 Achievements of Outputs

(1) Achievements of Output

Output 1: Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.
Objectively Verifiable Indicators (OVI) OVI 1-1. System for collecting information of track, rolling stock, signal and communication, and operation is established. OVI 1-2. Safety issues are listed based on the investigation and analysis of cause of accident. OVI 1-3. Service issues are listed. OVI 1-4. Service and safety improvement plan is drawn so as to tackle the issues.

As per discussed below, all the above mentioned indicators set for Output 1 have been met by the time of the Terminal Evaluation and thus **Output 1 is achieved**.

Regarding "OVI 1-1. System for collecting information of track, rolling stock, signal and communication, and operation is established," in order to collect relevant information, Project established Counterpart Team consisting of key managerial as well as technical members drawn from both Japanese and Myanmar side, structured in matching pairs. They are: Leader and Project Director, Deputy Leader and Project Manager, Railway Policy/Operations and Maintenance Improvement Expert and C/P, Track Maintenance Expert and C/P, Procurement of Equipment & Materials Expert and C/P, Signaling & Telecommunications Expert and C/P, Rolling Stock Expert and C/P, Train Operation Expert and C/P, and Structure Expert and C/P. These representatives played key roles in collecting information on train operation and rolling stock, including two experts visiting MR Headquarters and three rolling stock workshops for fact finding in August and September, 2013. In addition, based on responses on the questionnaire prepared by the Expert Team, "Present Situation of Safety and Service Level of MR" was compiled to guide further process for this Output.

On "OVI 1-2. Safety issues are listed based on the investigation and analysis of cause of accident," Project organized a workshop during the cause and analysis training conducted from February 10 to 28, 2014, where 25 topics relating to accidents and low service levels (train delay and speed restrictions) were selected based on the analysis of the actual events recorded by MR for the year 2012/2013. In the workshop, MR experts then analyzed the causes and presented appropriate countermeasures.

With respect to "OVI 1-3. Service issues are listed," following the cause and analysis training of February 10 to 28, 2014, Project conducted questionnaire survey on customer satisfaction to illuminate service issues. This survey was conducted on March 4 to 7, 2014 between Yangon Station and Nay Pyi Taw Station on Yangon-Mandalay Trunk Line, targeting MR passengers with the

exception of foreign travelers, based on interviews in the operating trains. Unfortunately, it turned out that general satisfaction level is very low. Yet, areas as well as level of dissatisfaction are clarified for improvement (such as riding comfortability, train speed, train delay, on-time departure/arrival, cleanliness, seat comfortability, staff attitude, booking, waiting facility).

Likewise, on "OVI 1-4. Service and safety improvement plan is drawn so as to tackle the issues," relevant technical standards in the field of civil, signal/telecommunications, operation, rolling stock engineering have been compiled and reported by MR, and preparation of recommendations started in the first year of Project implementation. Subsequently, the gist was compiled into "Report of Proposals," which was then discussed among the Project concerned people, and "Summary of Discussion in the Workshop for Recommendations on Technical Standards and for Drawing up Short- (2015-18), Medium- (2018-25), and Long-Term (2025-2045) Railway Facilities Improvement Plan" was prepared. After reviews, "Revised Report of Proposal of Recommendation on Technical Standards of MR and Short-, Medium-, and Long-Term Railway Facilities Improvement Plan" was prepared and presented at "Summarizing Workshop" held on December 15 to 19, 2014.

(2) Achievements of Output

Output 2: Technical capability is improved through emergency track maintenance to improve the level of service and safety.	
Objectively Verifiable Indicators (OVIs)	
OVI 2-1.	Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons).
OVI 2-2.	Working manual of emergency track maintenance is prepared.
OVI 2-3.	Proper equipment and materials are procured both qualitatively and quantitatively.
OVI 2-4.	Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others.

All the activities that have been planned under Output 2 have already been conducted by the time of Terminal Evaluation in a way to significantly exceed the indicators set forth, and thus **Output 2 is achieved**.

On "OVI 2-1. Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons)," prevailing track maintenance work in Myanmar prior to the Project was based on an old-fashioned, more manual system implemented in Japan in the past. Through the Project, track maintenance inspectors and workers of MR received education/training on basic mechanized maintenance system using large-scale maintenance machines. In the 46.5 mile section (74.8km long) between Yangon and Bago on Yangon-Mandalay line, track maintenance as a means of technical transfer in the approximately 20km Pilot Section was selected through a site survey to allow experiencing maintenance of different track structures, such as defective, sound, straight and

curved tracks, turnouts in station yards and bridges.

Project then conducted comprehensive training program for a batch of 30 trainees from the end of October, 2013 to mid-May, 2014. The sequence of technical transfer was as follows: based on assessment of the level of track maintenance technologies of MR employees and compilation of appropriate text books, the Experts held seminars on improvement of track maintenance technologies in three steps: (1) at the start of track maintenance On-the-Job-Training ("OJT"), (2) after the completion of maintenance, and (3) at the final summarization of OJT.

For the effectiveness of training, at the end of March, 2014, MR requested the Project to also include Dagon University Line and Thilawa Branch Line at Toekyaungkalay Station as Pilot Section work. The Project utilized this enlargement of the scope of Pilot Section as an opportunity to provide training to more staff, by re-programming the contents and timing to fit into one month program. The graduates of the training have since returned to their duty stations to apply obtained techniques. This increase led the Project to provide the training to over 500 (by the time of the Terminal Evaluation in January 2016). Given the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance.

With regard to the additional activity lines scheduled for follow-up period, namely, (1) lecture series on outsourcing track maintenance, including sharing of Japanese experiences, and (2) seminar and training course series on bridge maintenance were both offered by the Experts who were assigned for these themes.

In connection with "OVI 2-2. Working manual of emergency track maintenance is prepared," Japanese experts summarized the points of reflection through the whole maintenance work and compiled into a set of three maintenance manuals, (1) Safe Work Manual, (2) Track Work Manual, and (3) Measurement for Track Manual (English and Burmese) contextualized with local working situations including climates. While compilation activity was led by the Experts, C/P contributed to the review process toward finalization.

Likewise, "OVI 2-3. Proper equipment and materials are procured both qualitatively and quantitatively," equipment and materials were selected based on careful analysis of the prevailing situations/conditions, which in other words included procurement of equipment no longer in use in Japan, requiring extra time to obtain. Such process led to delay in procurement of some materials, but ensured applicability in the Myanmar context.

Finally, on "OVI 2-4. Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others," three combined cycles of (1) seminars and (2) training have been conducted. Each cycle consisted of (1) introduction of particulars related to track maintenance such as inspection, planning and work for the

workers in classroom setting, followed by practical training on track maintenance (inspection and work) on yard tracks wearing safety gears (such as protective shoes, helmets and safety vests), and (2) actual work on Pilot Section (October 2013, December 2013, and February, 2015). Aside, regular induction was provided throughout the Project period to new inspectors. In addition, final wrap up seminar is being scheduled to take place in the first week of February, 2016 to ensure the trainees can have an opportunity to reflect and solve any pending questions before the completion of the Project.

3-1-3 Prospect for Achieving the Project Purpose

Project Purpose: Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	
Objectively Verifiable Indicators (OVI)	
OVI 1.	Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR.
OVI 2.	Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR

The goal of achieving the Project Purpose, as determined by the indicators, **has been met** as stated below:

On "OVI 1. Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR," training program to guide MR staff to familiarize with techniques on cause of accident and low service level analysis and establishment of countermeasures was conducted from February 10 to 28 in 2014 at MR Headquarters ("HQ"), participated by 19 senior staff drawn from track maintenance, civil works, signaling, rolling stock and train operation divisions as well as from MR HQ. The training consisted of three parts: (1) classroom lecture with textbooks prepared by the Experts; (2) workshop, (3) training of vibration measurement of rolling stock. Following the training, interview survey to investigate customer satisfaction level of MR passengers was also conducted. On-site interviews of the Terminal Evaluation confirmed that the manuals prepared by the Project are now referenced for day-to-day practices mainly by inspectors. In addition, these manual sets serve as review materials for them to prepare for refresher exams they sit every two years.

On "OVI 2. Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR," the interviews conducted for Terminal Evaluation at the Pilot Section with the Project trainees endorsed that the Project introduced track maintenance techniques (using Project provided equipment) and safety culture (such as conducting visual check for safety, and wearing of safety gears like helmet, safety boots, safety vest) have been rooted into the track maintenance routines of the staff trained.

3-1-4 Prospect for Achieving the Overall Goal

Overall Goal: **Service and safety level of Myanma Railways is improved.**
Objectively Verifiable Indicators (OVIs) OVI 1. Number of annual accidents on Yangon-Mandalay line decreases compared with the present and past records OVI 2. Journey speed on Yangon-Mandalay line increases compared with the present journey speed OVI 3. Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation

The word "present" in the indicators is assumed to refer to 2013, the year of PDM revision to PDM_2. Thus, prospect of achieving the Overall Goal within three to five years after the completion of the Project must be determined based on the comparison of the corresponding figures of two time horizons at the minimum, the data of 2013 and the latest available at the time of Terminal Evaluation. Although the Terminal Evaluation Team requested the latest available data for these three indicators, such data has not been provided during the Terminal Evaluation interview. Without the availability of such dataset, the prospect of achieving the Overall Goal **cannot be determined or low at this stage**. Nevertheless, given importance of these three indicators to measure safety/ service level of the operation, it is strongly recommended that MR keeps these records available.

3-2. Implementation Process of the Project

3-2-1. Implementation of Activities and Ownership in Implementation

The planned activities have been fully implemented based on detailed sequential procedures proposed by the Experts, consulted with Myanmar side, and as appropriate refined by consensus. For effective implementation, the Project established "Working Group for Service and Safety Improvement" consisting of key managerial as well as technical members drawn from both Japanese and Myanmar side, structured in matching pairs. They are: Leader and Project Director, Deputy Leader and Project Manager, Railway Policy/Operations and Maintenance Improvement Expert and C/P, Track Maintenance Expert and C/P, Procurement of Equipment & Materials Expert and C/P, Signaling & Telecommunications Expert and C/P, Rolling Stock Expert and C/P, Train Operation Expert and C/P, and Structure Expert and C/P.

During implementation, several experts located at MR HQ were added to C/P Team, so that the analysis of accidents, low service level and discussion of countermeasures could be effectively executed. This is a positive example of the ownership presented and performed by the implementing agency.

3-2-2. Project Management

The Experts made an emphasis on regular communication with the MR management, through weekly reporting to General Manager in charge of Lower Myanmar Administration, for example. However, particularly since Project site was centered on Yangon area while MR HQ is located in Nay Pyi Taw, seamless communication was a little challenge. Typically JICA Project holds Joint Coordinating Committee ("JCC") meeting on a biannual basis, and this Project adopted such interval initially. By positive proposal by Myanmar side, however, it was changed to be held on quarterly basis. While this change put pressure on the Project for preparation, the higher frequency enabled more intimate environment for communication among the JCC members and therefore for the Project.

4. Result of the Evaluation

4-1. Evaluation by the Five Criteria

4-1-1 Relevance: High

The relevance of the Project is evaluated as **high** based on the assessments from the four angles below:

(1) Relevance with the Government policy of the Republic of the Union of Myanmar

"The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted in January 2016 by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services. It points out, however, that the quality of railway transport services, in terms of speed and accident control, is low mainly because of deteriorated track conditions and aged and poorly maintained passenger coaches and freight wagons, underlining the relevance of the Project with the country's current priority for the sub-sector.

(2) Alignment with strategic plan/direction of Myanmar's rail transport sector

Based on MR's recognition on the effectiveness of the Project, the target number of staff for technical transfer was increased upon request by MR, from the original number of 30 trainees to over 500 (at the time of the Terminal Evaluation in January 2016). Pilot Section coverage was also enlarged upon request to include Dagon University Line and Thilawa Branch Line centering Toekyaungkalay Station area. This enlarged scope of the Project is the testament of high relevance of the Project with the needs of the implementing agency to serve the end beneficiaries – customers – better. Given the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance in less than three years.

(3) Relevance with the Japan's ODA Policy

The Project was a direct response to "Japan's Assistance to Myanmar" (i.e. Japan's economic cooperation policy publicized on April 21, 2012) that highlights issues of operational improvement and modernization of the country's railways as a part of "infrastructure to promote economic development" and "development of infrastructure and related system necessary for the sustainable economic development." This economic cooperation policy is still current, endorsing the relevance of the Project.

(4) Comparative Empirical and Technological Advantage of Japan's Cooperation

Japan's own experiences in re-establishing the railway sector post WWII from the devastated state of significant loss of infrastructure and know-hows (such as loss of drawings) has enabled its technical cooperation to prioritize contextualization with the sectoral environment in which Myanmar is situated, who is pursuing to upgrade to mechanized system. Moreover, areas such as attention to details in equipment management and high safety standard are trademarks of Japanese railway sector, giving Japanese support an unparalleled position in the international assistance to the sector.

4-1-2 Effectiveness: High

The effectiveness of the Project is assessed as **high**, for having already met the Project Purpose as per the determined indicators based on solid results that were materialized through Output 1 and Output 2, as have already been discussed in 3-1-2 and 3-1-3.

The achievement of the Project was derived by a balanced combination of Japanese equipment and machinery selected for applicability for the technology transfer to Myanmar and the high technical expertise of the Japanese Experts who also possess compassionate characters. As Project Director noted in the Terminal Evaluation interview, this Project has been one of the kind MR had never experienced, and thus the results are directly attributable to the Project.

While the Project framework was well structured to develop associated technical skills through both theoretical (in seminars) and practical (both at non-operating track and actual OJT work) along with compilation of knowledge products (such as manuals), additionally, the Project benefited from support and relationship MR has with other parties. One such example is a donation of rails by a Japanese steel manufacture to MR installed on Yangon - Mandalay Line. It provided the Project an opportunity to check their strengthened, more technology oriented skills built through the Project.

4-1-3 Efficiency: High

The Efficiency of the Project is evaluated as **high** in view of the four dimensions of Input-Output relationships that the Project managed for results.

(1) Causality of Inputs and Outputs

The scope and the type of technical transfer (i.e. on mechanized track maintenance) was new to the C/P, and without the Project it would not have been introduced to MR. For that matter, there was direct cause and effect relationship between Project inputs and outputs.

(2) Achievements of Outputs

The important assumption set for the Project at the launch that is “The Government support to the MR, especially financial support is secured,” held to support the Outputs to be produced.

(3) Appropriateness of Inputs by Japan

The planned input was procured to support effective implementation of the Project. Regarding Japanese Experts, in order to address very specific expertise sought, particularly in the area of track maintenance, five Experts were assigned to respectively cover their specialty areas. For the whole duration of the Project period including follow-up period, a total of 79 M/M Experts’ time was allocated to this Project (up to January 2016). Eleven percent of this M/M was shouldered by the dispatching company of the Expert Team as the company’s own proposal/initiative in order to enhance the project effectiveness and sustainability.

With regard to some of the equipment and machinery selected for the suitability for MR were no longer readily available in the Japanese market, procurement of those items required additional time to import into the country. The demand for and evaluation of the Project introduced Japanese equipment was extremely high with appreciation among C/P, expressed at the time of Terminal Evaluation interviews. These comments included practicality of hand tie tampers (so much easier to handle than the huge machines traditionally used in Myanmar) and precision of vibration measuring equipment. All in all, exposure to new type of equipment through the Project put the work of C/P a level higher toward more mechanized maintenance operation.

Training in Japan was also highly valued by C/P as an eye-opening experience to see some of the Japanese system, such as signaling and safety door at stations. While not all the system can be readily introduced to Myanmar, some track technologies are applicable and thus it was enlightening, was the word of one training participant interviewed for Terminal Evaluation.

(4) Appropriateness of Inputs by the Myanmar side

Myanmar side also made the effort in securing resources to support the Project activities. It included expenses for Pilot Site work and materials and C/P travel. Also, Myanmar side provided temporary housing facility for the trainees.

4-1-4 Impact: Fair

As discussed under "3-1-4 Prospect for Achieving the Overall Goal," unavailability of comparator data set over a minimum of two time points by the time of Terminal Evaluation makes assessment on whether the Project is on a course to achieve the Overall Goal is impossible at this stage.

However, the Project produced results have and are expected to continue to aid the other activities MR has been and will be conducting with JICA, such as "The Project for Installation of Operation Control Center System (2013-2014)" and "Detailed Design Study for Yangon - Mandalay Railway Improvement Project." Such synergy is expected to positively affect the results of Project achievement toward meeting the Overall Goal.

If MR continues to move on a similar trajectory with regard to their staffing composition, the important assumptions set for the Overall Goal, that are "Administration staff members are not relocated drastically," and "Technical staff members are not relocated drastically" are anticipated to hold through the time till the impact is measured at Ex-Post Evaluation, i.e. three to five years after the Project completion.

Given the prospect for achieving the Overall Goal entails mixed potential, impact is assessed as **fair**.

4-1-5 Sustainability: Fair

(1) Institutional Aspect

"The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted in January 2016 by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services. For the connectivity MR provides both for citizens (passenger service) and business (freight service) for the country's national development, priority entrusted on to MR is expected to continue.

(2) Organizational Aspect

One positive push factor for the organization is the recent enactment of New Railway Act (January 2016). It will require MR to review and furnish new rules and regulations, and the Project prepared manuals and documents can provide good starting references, according to the comment of MR Manager. This is one area where MR can be motivated to bring forward experiences they accumulated with the Project.

To ensure the results of the Project to be institutionalized more broadly on its sustainability, review of organizational structure of MR to see if housing a unit that will oversee safety issues across divisions might merit consideration. This time the Project worked with Civil Division mainly, but going forward, mainstreaming safety as an organizational agenda with a cross-cutting unit will make MR a more effective organization on safety concerns.

(3) Technical Aspect

The graduates of the training have since returned to their duty stations throughout the country to apply obtained techniques. This increase led the Project to provide the training to over 500 (by the time of the Terminal Evaluation in January 2016). Given the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance.

Project arranged additional equipment for the increased scope and coverage of the trainees. On these additional equipment, at the 8th JCC meeting, it was agreed that allocation of one set to each division is important. At the time of Terminal Evaluation, however, the allocation has not been completed. Thus, it will be important for the Project to complete the equipment allocation before its closure in a way so that the Project trained staff can continue with the technology they have acquired from the Project.

(4) Financial Aspect

As a monopolized state-owned transport enterprise, MR has maintained its operation under deficit as the sole critical mass transit mode for the country. This operation mode is considered to continue in the coming years, and it will be an institutional judgement and decision as to how much/less to resource the organization for carrying forward the results produced by the Project. However, as discussed multiple times in this report, national importance is attached to MR, and thus, its status as on-going concern is not doubted. Yet, since MR always faces competition with other modes of transport, attention to and prioritization on financial soundness will definitely help the organization's footing in the industry.

For the achievement of the Project to be maintained and/or further expanded by the Myanmar side after the Project period, there is room for efforts, such as mainstreaming safety agenda within MR by setting up a cross-cutting unit, timely completion of additional equipment distribution to duty stations of the Project participated trainees, and attention to financial soundness to enable investment in succeeding Project produced results. Thus, sustainability of the Project achievements is assessed as **fair**.

4-2. Conclusion

The relevance of the Project is evaluated as high based on its close alignment with (1) the Government policy of the Republic of the Union of Myanmar, (2) the strategic direction of the country's rail transport sector, (3) the Japan's ODA Policy, and (4) comparative empirical and technological advantage of Japan's cooperation. The effectiveness of the Project is assessed as high, for the achievement of Project Purpose before the completion of the Project. The efficiency of the Project is evaluated as high in view of the four dimensions of input-output relationships that the Project managed for results: (1) causality of inputs and outputs; (2) achievements of outputs; (3) appropriateness of inputs by Japan; (4) appropriateness of inputs by Myanmar. The prospect for achieving the Overall Goal against the preset indicators cannot be determined or low, which in turn warrants a rating of fair for the Project impact. Project sustainability is also considered fair, based on a comprehensive assessment of the implementing agency's current institutional, technical, and financial aspects.

Terminal Evaluation Team thus confirmed successful implementation of the Project with full achievement of the Project Purpose and reached a conclusion that the Project be completed in March 2016 as per signed M/M of April 6, 2015.

5. Recommendations and Lessons Learned

5-1. Recommendations

Based on the findings, Terminal Evaluation Team presents the following recommendations to be addressed by the completion of the Project, as well as after the Project completion toward achievement of Overall Goal.

5-1-1 To be Responded by the Completion of the Project

Project arranged additional equipment for the increased scope and coverage of the trainees. On these additional equipment, at the 8th JCC meeting, it was agreed that allocation of one set to each division is important. At the time of Terminal Evaluation, however, the allocation has not been completed. Thus, it will be important for the Project to complete the equipment allocation before its closure in a way so that the Project trained staff can continue with the technology they have acquired from the Project.

5-1-2 To be Considered for Successful Achievement of the Overall Goal in Three to Five Years After the Project Completion

(1) By the enlarged scope of track maintenance technology transfer, the Project could manage basic track maintenance using technology to a critical portion of civil staff at MR. Now MR has a sufficient foundation to mainstream new practices nationwide. It is hoped that training for such techniques will be incorporated into existing training conducted by MR.

(2) In this Project, the focus was placed on safety and service improvement through track maintenance. Achievement of the Overall Goal will be supported by a comprehensive measures beyond track maintenance. In order for MR to tackle safety improvement issues organization wide, an establishment of a cross-cutting safety unit to more broadly oversee on safety matters merit consideration.

(3) For Overall Goal, the Project used indicators that require at least two comparative figures from different time points for judgement (e.g. speed in 2013 and 2015). However, since baseline and present figures have not been compiled by the time of Terminal Evaluation, Evaluation Team had to conclude that the prospect of meeting Overall Goal cannot be determined or low. Nevertheless, given importance of these three indicators to measure safety/ service level of the operation, it is strongly recommended that MR keeps these records available.

5-2. Lessons Learned

Below are lessons drawn from the Project for reference to other JICA projects with shared characteristics:

(1) Experts with highly advanced knowledge and technology in the given field carefully examined the working environment of MR, and selected appropriate equipment and technology transfer arrangement. Carefully crafted plans and implementation procedure by the joint effort of the implementing agency and the Experts secured solid technology transfer achievement.

(2) Because the Project was managed by a team of Experts with full access to technically advanced train service operation in Japan, C/P training in Japan could be organized to entail aspects/cases that are concrete as well as motivational for them. This experience has positively affected the staff of the implementing agency, and made the subsequent Project activities more vibrant.

(3) For Overall Goal, the Project used indicators that require at least two comparative figures from different time points for judgement (e.g. speed in 2013 and 2015). However, since baseline and present figures have not been compiled by the time of Terminal Evaluation, Evaluation Team had to conclude that the prospect of meeting Overall Goal cannot be determined or low.

Annex 1: Evaluation Schedule

Date		Schedule
17-Jan	Sun	00:20 Haneda (TG661) → 05:25 Bangkok 08:00 Bangkok (TG303) → 08:45 Yangon (Evaluation and Analysis)
18-Jan	Mon	09:00 Project Office 11:00 JICA Office 13:30 Japanese Expert Interview
19-Jan	Tue	07:00 Yangon (KBZ) → 8:00 (delayed to 12:30) Nay Pyi Taw 14:00 Meeting with Japan training participant 14:30 Meeting with Mr. Aung Win / GM (Technical & Admin), MR (Project Director) w/his team 15:00 Meeting with Mr. Maung Maung Thwin, DGM (Civil), MR (Deputy Project Manager) 18:35 Nay Pyi Taw Dep (FMI)→ 19:35 Yangon
20-Jan	Wed	10:00 Meeting with Mr. Htun Aung Thin, GM Lower Myanmar Administration 15:00 Meeting with Mr. Tin Myint, AGM (Civil), Division 7
21-Jan	Thu	08:30: Visit Toe Kyang Ka Lay Station area (Pilot Section) PM: Data Analysis
22-Jan	Fri	AM: Yangon Station for site visit on train control Reflection Meeting with Project PM: Data Analysis
23-Jan	Sat	Report drafting (Evaluation and Analysis)
24-Jan	Sun	Report drafting (Evaluation and Analysis) 11:45 Narita (NH813) → 17:15 Yangon (Leader, Evaluation Management)
25-Jan	Mon	13:00 Meeting with Mr. Htun Aung Thin, GM, Lower Myanmar Adm. 14:00 Meeting with JICA Office 17:15 Yangon (FMI) → 18:15 Nay Pyi Taw (all members)
26-Jan	Tue	AM: Internal Team Meeting on Draft Evaluation Report 15:00 Discussion with Mr. Tin Soe, GM (Civil), Mr. Maung Maung Thwin, DGM (Civil), MR (Deputy Project Manager) and Civil staff on Draft Joint Evaluation Report
27-Jan	Wed	Draft Evaluation Report Review by Myanmar side 13:00 meeting with Mr. Aung Win / GM (Technical & Admin), MR (Project Director), Mr. Maung Maung Thwin, DGM (Civil), MR (Deputy Project Manager), and other senior members of MR
28-Jan	Thu	16:00 Confirmed with Myanmar side on no-change to Draft Report
29-Jan	Fri	10:00 Joint Coordinating Committee (JCC)/MM Signing 17:30 Nay Pyi Daw (FMI) → 18:30 Yangon (All mission members) 22:10 Yangon (NH814) (Leader, Evaluation Management)
30-Jan	Sat	→ 06:45 Narita (Leader, Evaluation Management) 19:50 Yangon (TG306) → 21:45 Bangkok 23:15 Bangkok (TG682)
31-Jan	Sun	→ 06:55 Haneda (Evaluation and Analysis)

Annex 2: List of Interviewees

1. Myanma Railways

Name	Position	Role in the Project
Mr. Aung Win	General Manager (Technical & Admin)	Project Director
Mr. Tin Soe	General Manager (Civil)	Project Manager
Mr. Maung Maung Thwin	Deputy General Manager (Civil)	Deputy Project Manager
Mr. Htun Aung Thin	General Manager, Lower Myanmar Administration	
Mr. Maung Maung Than	Deputy General Manager (Civil)	C/P
Mr. Win Bo	Assistant General Manager (Civil)	MR Headquarters (Civil)
Mr. Zaw Min U	Divisional Engineer (Civil)	MR Headquarters (Civil)
Mr. Zaw Ye Myint	Assistant Engineer (Civil)	MR Headquarters (Civil)
Ms. Daw Khim May Than	Assistant Manager (Planning & News)	Participant of Training in Japan

2. Japanese Expert

Name	Position
Mr. Nobuyuki MATSUO	Leader/Railway Operation and Maintenance Improvement・Maintenance Planning
Mr. Mitsuru TAKAMI	Deputy Leader / Bridge Maintenance
Mr. Hiroshi KOMATSU	Operation and Maintenance

Annex 3: Inputs
Annex 3-1: Input by the Japanese Side

5−1−3 Assignment of Experts

Field of Expertise	Name	Dispatched period (M/M)					
		2013	2014	2015	2016	Total	Out of which Non-JICA budget (M/M)
Leader/Railway Operation and Maintenance Improvement	Mr. Sadaaki Kuroda	1.53	2.80	0.50		4.83	
Leader/Railway Operation and Maintenance Improvement・Maintenance Planning	Mr. Nobuyuki Matsuo			4.90	0.76	5.66	
Deputy Leader / Maintenance Planning	Mr. Nobuyuki Matsuo	4.53	6.07	2.57		13.17	
Deputy Leader / Bridge Maintenance	Mr. Mitsuru Takami			2.23	0.73	2.96	
Operation and Maintenance	Mr. Hiroshi Komatsu	4.27	10.27	9.20	1.22	24.96	
Procurement of Equipment and Material	Mr. Tomohiro Aizuki （Mr. T. Nakamura） （Mr. Y. Taniguchi）	1.07	0.70	0.30	0.03	2.10	
Signaling and Telecommunications Expert	Mr.Ryuhei Mitani （Mr. K. Takemura）	0.23	1.57			1.80	
Rolling Stock Expert	Mr. Makoto Ishikawa	0.50	1.80	0.20		2.50	
Track maintenance (1)	Mr.Osamu Haga (Mr. H. Fujiwara) (Mr. M. Wakatsuki) （Mr. K. Murao）	1.47	4.13	4.73		10.33	
Track maintenance (road bed)	Mr. Mitsuru Takami (Mr. K. Miyamoto)	0.03	1.54			1.57	
Operation expert	Mr. Shunji Morihara (Mr.Hideharu Igarashi)	0.50	1.30	0.47		1.80	1.80
Project Coordinator	Mr. Mitsuru Takami	2.26	0.40	0.47		3.13	3.13
Track maintenance (2)	Mr. Keiichi Kobayashi （Mr. Hisayoshi Mitsui）	1.73	0.13	0.20		2.06	1.86
Track maintenance (3)	Mr. Makoto Toya （Mr. Seitoku Tanaka）	0.50		0.20		0.70	0.50
Track maintenance (4)	Mr. Hisashi Komatsu （Mr. Takashi Ito）	1.23		0.20		1.43	1.23
Track maintenance (5)	Mr. Masahiro Osanai					0.00	
Total						79.00	8.52

Note: Previous Experts are in parenthesis.

5-1-4 Training in Japan

The Japanese side has provided training in Japan to 33 managerial as well as technical staff members from Myanma Railways over the course of three separate training: (1) June 8-21, 2014 (track maintenance for 11 participants), (2) June 22-July 5, 2014 (track maintenance for 11 participants), and (3) October 19-November 1, 2014 (railway institutional management improvement for 11 participants).

Technical training (1) and (2) consisted of lectures, OJT practice followed by reflection sessions, and field visits. Managerial training (3) consisted of lectures, discussion/presentations, and site visits.

The following is the list of participants:

(1) Track Maintenance (June 8-21, 2014)

	Name	Position Title	Affiliation
1	Mr. Ye Htut	Assistant Engineer (Civil)	Nay Pyi Taw
2	Mr. Kyaw Lwin	Assistant Engineer (Civil)	Division (3)
3	Mr. Saw Naing	Permanent Way Inspector (1)	Division (3)
4	Mr. Aung Swe	Permanent Way Inspector (1)	Division (6)
5	Mr. Han Tin Soe	Permanent Way Inspector (1)	Division (8)
6	Mr. Win Nyunt	Permanent Way Inspector (2)	Central Institute of Transport and Communication, Meiktila
7	Mr. San Yu	Permanent Way Inspector (2)	Division (1)
8	Mr. Chit Ko Ko	Permanent Way Inspector (2)	Division (2)
9	Mr. Than Naing	Permanent Way Inspector (2)	Division (3)
10	Mr. Aung Thein Win	Permanent Way Inspector (2)	Division (6)
11	Mr. San Naing	Permanent Way Inspector (2)	Division (6)

(2) Track Maintenance (June 22-July 5, 2014)

	Name	Position Title	Affiliation
1	Mr. Soe Myint Aung	Assistant Engineer (Civil)	Division (4)
2	Mr. Aye Nyeub Swe	Assistant Engineer (Civil)	Division (3)
3	Mr. Han Thein	Permanent Way Inspector (1)	Division (11)
4	Mr. Kyaw Thu Ya	Permanent Way Inspector (1)	Katha-Bahmo
5	Mr. Moe Kyaw Aung	Permanent Way Inspector (2)	Yangon-Pathein
6	Mr. Kyaw Htet Zaw	Permanent Way Inspector (2)	Division (6)
7	Mr. Aye Min Aung	Permanent Way Inspector (2)	Division (11)
8	Mr. Kyaw Tun Linn	Permanent Way Inspector (2)	Division (2)
9	Mr. Aung Aung	Permanent Way Inspector (2)	Division (5)
10	Mr. Hla Htay Win	Permanent Way Inspector (2)	Division (4)
11	Mr. Thaung Tun Aye	Permanent Way Inspector (3)	Division (5)

(3) Railway Institutional Management Improvement (October 19-November 1, 2014)

	Name	Position Title	Affiliation
1	Mr. Win Naing	Deputy General Manager (Carriage)	Headquarters
2	Mr. Htay Myint Aung	Deputy General Manager (Operation)	Headquarters
3	Ms. Daw Kyi Kyi Nwe	Assistant General Manager (Finance)	Mandalay Branch
4	Mr. U Lwan Thu	Executive Engineer (Civil)	Bago Branch
5	Mr. Maung Maungt Tin	Manager (Supply)	South Myanmar Region
6	Mr. Aung Chan Myint	Manager (Commercial)	Headquarters
7	Mr. Myint Lwin	Executive Engineer (Communication)	Yangon Branch
8	Mr. Aung Wai Soe	Assistant Manager (Inspection)	Headquarters
9	Ms. Daw Khin May Than	Assistant Manager (Planning & News)	Headquarters
10	Mr. U Nyo Aung	Assistant Engineer (Electric)	Yangon Branch
11	Mr. Aung Mying	Assistant Manager (Planning)	Headquarters

5−1−5 Provision of Equipment and Materials

Type of Equipment	Amount (JPY)	Remarks
Test Measuring Equipment for Track Maintenance OJT	9,490,600	
Test Measuring Instrument	374,800	
Working Machinery and Instrument	46,059,959	
Equipment and Materials for Track Maintenance Work	2,611,000	estimate
Bridge Inspection Work Tools for Bridge Maintenance OJT	243,000	
Safety Equipment (helmets, safety vests, safety boots, work globes, etc.)	2,869,000	estimate
Total (approx.)	61,648,359	

5-1-3 Operational Expenses by Japanese Side

Category	Description	Amount				
		Unit	FY2013 (from May)	FY2014	FY2015 (up to Nov)	Sub-Total
Local staff	Secretary	USD	8,024	12,647	9,779	30,450
Local staff	Interpreter for office	USD	10,847	16,263	11,891	39,001
Local staff	2interpreter and 2 engineers for track OJT	USD	10,961	38,584	21,734	71,279
Local staff	interpreter for JCC and other	USD	3,055	3,400	6,550	13,005

Local staff	Accommodation	USD	1,200	935	553	2,688
Air		USD	4,132	3,220	1,905	9,257
Car Rental	for track OJT	USD	18,322	30,428	21,583	70,333
Car Rental	for JCC and other activities	USD	5,701	7,563	3,575	16,839
	USD sub-total	USD	62,242	113,040	77,570	252,852
Maintenance	for equip/office	MMK	411,147	1,989,156	1,161,390	3,561,693
Consumable	for OJT	MMK	10,940,510	23,139,123	20,945,243	55,024,876
Consumable	for Office	MMK	6,505,042	8,419,767	7,835,980	22,760,789
	MMK sub-total	MMK	17,856,699	33,548,046	29,942,613	81,347,358
Total in	(approx.)	USD	76,046	138,975	100,718	315,739
Total in	(approx.)	JPY	9,148,386	16,718,680	12,116,334	37,983,400

Annex 3-2: Input by the Myanmar Side

Annex 3-2-1 Assignment of C/Ps

Field	Name/Position
Project Director	Mr. Aung Win（U Saw Valentine） / GM (Technical & Admin. Support)
Project Advisor	Mr. Saw Valentine, Advisor
Project Manager	Mr. Tin Soe/ GM (Civil)
Deputy Project Manager	Mr. Maung Maung Thwin /DGM (Civil)
HQ based C/P	Mr. Maung Maung Than / DGM (Civil)
Track Maintenance Contracting	
Bridge Maintenance	
Operation and Maintenance	Mr. Kyaw Kyaw Myo / AGM (Operation)
Track Maintenance	Mr. Than Htay/ DGM (Civil) Mr. Tin Myint (U Maung Maung Than) / AGM (Civil)
Procurement of Equipment and Material	Mr. Khin Maung Than (Win Htein) / DGM(Supply)
Signaling and Telecommunications	Mr. Khin Maung Thein/ DGM (S&T) (Mr. Myint Lwin/ AE (S&T), Mr. Han Nyunt/ AGM (S&T))
Rolling Stock	Mr. Win Oo/ GM (Rolling Stock) (Mr. San Myint/ Train Operation, Mr. Thet Lwin/ DGM (Rolling Stock)
Train Operation	Mr. Htay Myint Aung/ DGM (operation) (Mr. Zaw Pe Sein/ Divisional Traffic Manager)
Structure	Mr. Tin Win/ DGM (Civil)

Note: Previous C/P are in parenthesis.

Annex 4: Evaluation Grid (Results of the Evaluation)

SECTION I. Project Achievements

Evaluation Questions		Results
Main Questions	**Sub Questions**	
Prospect for Achieving the Overall Goal	To what degree has the Overall Goal been achieved? **<u>Overall Goal</u>:** Service and Safety Level of Myanma Railways is improved.	**OVI 1. Number of annual accidents on Yangon-Mandalay line decreases compared [from the base year of 2014/2015]]** **<u>Means of Verification</u>: Statistics on safety** **OVI 2. Journey speed on Yangon-Mandalay line increases compared [from the base year of 2014/2015]** **<u>Means of Verification</u>: Statistics on operation** **OVI 3. Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation [of the base year of 2014/2015]** **<u>Means of Verification</u>: Statistics on operation** • Given the Project has placed MR on a positive course for safety and service improvement, there is good potential for the implementing agency to achieve Overall Goal in three to five years after the Project completion, the time set for Ex-Post Evaluation as per JICA rule. However, since to what extent pre-determined indicators are achieved will be measured only at that time, probability of satisfying these indicators cannot be determined at this stage.
Prospect for Achieving the Project Purpose	To what degree has the Project Purpose been achieved? **<u>Project Purpose:</u>** Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	**OVI 1: Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR.** ⇒ Achieved. **<u>Means of Verification</u>: * Reflection on organization, management/operation rules, facilities renewal plans** • Training program to guide MR staff to familiarize with techniques on cause of accident and low service level analysis and establishment of countermeasures was conducted from February 10 to 28 in 2014 at MR Headquarters, participated by 19 managerial level staff (drawn from track maintenance, civil works, signaling, rolling stock and train operation divisions) as well as MR HQ. • The training consisted of three parts: (1) classroom lecture with textbooks prepared by JICA experts; (2) workshop, (3) training of vibration measurement of rolling stock. • Following the training, interview survey to investigate customer satisfaction level of MR passengers was also conducted. ***Utilization, modification of administration management manuals** ⇒ Achieved. • The manuals have been referred mainly by Inspectors, who are tested for their knowledge every two years at MR HQ, and for such examinations have been consulting the manuals as necessary and appropriate. **OVI 2: Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR** ⇒ Achieved.

Evaluation Questions		Results
Main Questions	Sub Questions	
		<u>Means of Verification</u>: Actual results of maintenance execution, such as the record of maintenance • The interviews conducted at the Pilot Section with the Project trainees confirmed that the Project introduced track maintenance techniques (using Project provided equipment) and practices (such as visual check for safety, wearing of safety gears like helmet, safety boots, safety vest) have been rooted into the track maintenance routines of the staff trained.
Achievement levels of the Outputs	To what degree has Output 1 been achieved? **<u>Output 1</u>:** Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.	**OVI 1-1 System for collecting information of track, rolling stock, signal and communication, and operation is established.** ⇒ Achieved. **<u>Means of Verification</u>: 1-1 Related management document(s) of system for collecting information** • In order to collect relevant information, Project established Counterpart Team consisting of key managerial as well as technical members drawn from both Japanese and Myanmar side, structured in matching pairs. They are: Leader and Project Director, Deputy Leader and Project Manager, Railway Policy/Operations and Maintenance Improvement Expert and C/P, Track Maintenance Expert and C/P, Procurement of Equipment & Materials Expert and C/P, Signaling & Telecommunications Expert and C/P, Rolling Stock Expert and C/P, Train Operation Expert and C/P, and Structure Expert and C/P. These representatives played key role in collecting information on train operation and rolling stock, including two experts visiting MR Headquarters and three rolling stocks workshops for fact finding in August and September, 2013. In addition, based on responses on the questionnaire prepared by JICA Expert Team, "Present Situation of Safety and Service Level of MR" was compiled to guide further process for this Output. **OVI 1-2 Safety issues are listed based on the investigation and analysis of cause of accident** ⇒ Achieved. **<u>Means of Verification</u>: 1-2 Listed issues** • Project organized a workshop during the cause and analysis training conducted from Feb. 10-28, 2014, where 25 topics relating to accidents and low service levels (train delay and speed restrictions) were selected from actual MR events in 2012/2013. In the workshop, MR experts then analyzed the causes and presented appropriate countermeasures. **OVI 1-3 Service issues are listed.** ⇒ Achieved. **<u>Means of Verification</u>: 1-3 Listed issues** • Following the cause and analysis training (Feb. 10-28, 2014), Project conducted questionnaire survey on customer satisfaction to illustrate service issues. It was conducted on March 4-7, 2014 between Yangon Station and Nay Pyi Taw Station on Yangon-Mandalay Trunk Line, targeting MR passengers, except foreign travelers, based on interviews in the running trains. • Unfortunately, it was illuminated that general satisfaction level is very low. Yet, areas as well as level of dissatisfaction are clarified for improvement (such as riding comfortability, train speed, train delay, on time departure/arrival, cleanliness, seat comfortability, staff attitude, booking, waiting facility). **OVI 1-4 Service and safety improvement plan is drawn so as to tackle the issues** ⇒ Achieved. **<u>Means of Verification</u>: 1-4 Service and safety improvement plan**

Evaluation Questions		Results
Main Questions	Sub Questions	
		• Relevant technical standards in the field of civil, signal/telecommunications, operation, rolling stock engineering have been supplied by MR, and preparation of recommendations started in the first year of Project implementation. Subsequently, the gist was compiled into "Report of Proposals," which was then discussed among the Project concerned people, and "Summary of Discussion in the Workshop for Recommendations on Technical Standards and for Drawing up Short- (2015-18), Medium- (2018-25), and Long-Term (2025-2045) Railway Facilities Improvement Plan" was prepared. After reviews, "Revised Report of Proposal of Recommendation on Technical Standards of MR and Short-, Medium-, and Long-Term Railway Facilities Improvement Plan" was prepared and presented at "Summarizing Workshop" on December 15-19, 2014.
Achievement levels of the Outputs	To what degree has Output 2 been achieved? **Output 2:** Technical capability is improved through emergency track maintenance to improve the level of service and safety.	**OVI 2-1. Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons).** ⇒ Achieved. **Means of Verification: 2-1 Record of technical transfers** • The prevailing track maintenance work in Myanmar prior to the Project was based on an old-fashioned, more manual system implemented in Japan in the past. Through the Project, track maintenance inspectors and workers of MR received education/training on basic mechanized maintenance system using large-scale maintenance machines. • In the 46.5 mile section (74.8km long) between Yangon and Bago on Yangon-Mandalay line, track maintenance as a means of technical transfer in the approximately 20km Pilot Section was selected through a site survey to allow experiencing maintenance of different track structures, such as defective, sound, straight and curved tracks, turnouts in station yards and bridges. Project then conducted comprehensive training program for a batch of 30 trainees from the end of October, 2013 to mid-May, 2014. • The sequence of technical transfer was as follows: based on assessment of the level of track maintenance technologies of MR employees and compilation of appropriate text books, JICA experts held seminars on improvement of track maintenance technologies (targeting 20 or so participants) in three steps: (1) at the start of track maintenance OJT, (2) after the completion of maintenance, and (3) at the final summarization of OJT. • For the effectiveness of training, at the end of March, 2014, MR requested the Project to also include Dagon University Line and Thilawa Branch Line at Toekyaungkalay Station as Pilot Section work. The Project utilized this enlargement of the scope of Pilot Section as an opportunity to provide training to more staff, by re-programming the contents and timing to fit into one month program. The graduates of the training have since returned to their duty stations to apply obtained techniques. • With regard to the additional activity lines scheduled for follow-up period, namely, (1) lecture series were organized on outsourcing track maintenance, including sharing of Japanese experiences, and (2) seminar and training courses were offered on bridge maintenance in phases. **OVI 2-2. Working manual of emergency track maintenance is prepared.** ⇒ Achieved. **Means of Verification: 2-2 Set of working manual** ① Safe Work Manual ② Track Work Manual ③ Measurement for Track Manual • Japanese experts summarized the points of reflection through the whole maintenance work and compiled the maintenance manuals (English and Burmese) to meet the present status of the track maintenance in Myanmar in consideration of the local organization, working conditions and climates. While compilation activity was led by the Japanese Experts, C/P participated in review process toward finalization.

Evaluation Questions		Results
Main Questions	Sub Questions	
		OVI 2-3. Proper equipment and materials are procured both qualitatively and quantitatively. ⇒ Achieved. **Means of Verification: 2-3 Inventory list of equipment and materials** • Equipment and materials were selected based on careful analysis of the prevailing situations/conditions, which in other words included procurement of equipment no longer in use in Japan, requiring extra time to obtain. Such process led to late procurement of some materials, but ensured appropriateness with Myanmar context. **OVI 2-4. Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others.** ⇒ Achieved. **Means of Verification: 2-4 Record of seminar and training** • Three combined cycles of (1) seminars and (2) training have been conducted. Each cycle consists of (1) introduction of particulars related to track maintenance such as inspection, planning and work for the workers in classroom setting, followed by practical training on track maintenance (inspection and work) on yard tracks wearing safety gears (such as protective shoes, helmets and safety vests), and (2) actual work on Pilot Section (October 2013, December 2013, and February, 2015). Aside, regular induction was provided throughout Project period to new inspectors. In addition, final wrap up seminar is being scheduled to take place in the first week of February, 2016 to ensure the trainees can have an opportunity to reflect and solve any questions hanging in their minds before the completion of the Project.
Achievement of Inputs	Have the Japanese side's inputs been allocated as planned?	• **Personnel (Japanese the JICA Expert Team):** The Japanese side has assigned 79M/M (inclusive of 8.52M/M supported by non-JICA budget) performed by cumulative total of 27 Experts to the Project. (See Annex 3-1-1 Assignment of the JICA Expert Team). • **Training in Japan** The Japanese side has provided training in Japan to managerial and technical staff members from Myanma Railways (totaling 33 members) over the course of three separate training: (1) June 8-21, 2014 (track maintenance for 11 participants), (2) June 22-July 5, 2014 (track maintenance for 11 participants), and (3) October 19-November 1, 2014 (railway institutional management improvement for 11 participants). (See Annex 3-1-3 Training in Japan). • **Provision of equipment and materials:** The Japanese side has provided equipment necessary for the implementation of the Project, which amounted to Japanese Yen (JPY) 62 million (Approximately USD 0.52 million) (See Annex 3-1-4 Provision of Machinery and Equipment). • **Operational Expenses:** The Japanese side has allocated the total amount of USD 315,739 equivalent (JPY 37,983,400) for the operational costs of project activities (see Annex 3-1-4 "Operational Expenses by Japanese Side").
	Have the Myanmar side's inputs been allocated as planned?	• **Counterpart personnel:** The Myanmar side has assigned Project Director, Project Manager, and C/P in the cumulative total of 19 personnel, drawn from Myanma Railways (MR) who constituted Counterpart Team, (See Annex 3-2-1 Assignment of C/P Personnel).

Evaluation Questions		Results
Main Questions	Sub Questions	
		• **Facilities:** The Myanmar side has provided office space for JICA Expert Team as well as temporary dormitory facility for trainees. • **Local cost:** • The Myanmar side has covered necessary operational costs of Project activities including expenses for Pilot Site work and materials and C/P travel.

SECTION II. Implementation Process

Evaluation Questions		Results
Main Questions	Sub Questions	
Implementation of Activities and Ownership in Implementation	To what degree have project activities been implemented as planned? Has the implementation agency (i.e. Myanma Railways) demonstrated an adequate level of ownership to enhance their management capacity?	• The planned activities have been fully implemented based on detailed sequential procedures proposed by Japanese Experts, consulted with Myanmar side, and as appropriate refined by consensus. • For effective implementation, the Project established "Working Group for Service and Safety Improvement" consisting of key managerial as well as technical members drawn from both Japanese and Myanmar side, structured in matching pairs. They are: Leader and Project Director, Deputy Leader and Project Manager, Railway Policy/Operations and Maintenance Improvement Expert and C/P, Track Maintenance Expert and C/P, Procurement of Equipment & Materials Expert and C/P, Signaling & Telecommunications Expert and C/P, Rolling Stock Expert and C/P, Train Operation Expert and C/P, and Structure Expert and C/P. • "During implementation, several experts located at MR HQ were added to C/P Team, so that the analysis of accidents, low service level and discussion of countermeasures could be effectively executed…." (Progress Report March 2015, p. 42) This is a positive example of the ownership presented and performed by the implementing agency.
Project management	Are there any issues with the project management? Has there been an effective communication and information sharing among CP and between CP and Experts?	• The Experts made an emphasis on regular communication with the MR management, through weekly reporting to GM in charge of Lower Myanmar Administration, for example. However, particularly since Project site was centered on Yangon area while MR Headquarters is located in Naypyidaw, seamless communication was a bit of a challenge. • Typically JICA Project holds JCC meeting on a biannual basis, and this Project adopted such interval initially. By positive proposal by Myanmar side, however, it was changed to be held on quarterly basis. While this change put pressure on the Project for preparation, the higher frequency supported more intimate communication among the JCC members and therefore for the Project.

SECTION III: Evaluation by the Five Criteria

	Evaluation Questions		Results
	Main Questions	**Sub Questions**	
Relevance	Relevance with the Government policy of Myanmar	Has the Project been in line with the priority of development policies of the Government of Myanmar as well as vision, principles, and strategic plan of Myanmar Railways?	• "The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services (p. 9-27). It points out, however, that the quality of railway transport services, in terms of speed and accident control, is low mainly because of deteriorated track conditions and aged and poorly maintained passenger coaches and freight wagons, underlining the relevance of the Project with the country's current priority for the sector.
	Relevance with the needs of beneficiaries	Has the Project Purpose been in line with the needs of the target group? Have the needs of the target group been high? **Target Group:** [had not been defined. By discussion with Expert Team, it was confirmed that Myanma Railways' civil engineers" were essentially the target of the Project activities.	• Based on MR's recognition of the effectiveness of the Project, the target number of staff for technical transfer was increased upon request by MR, from the original number of 30 trainees to over 500 (at the time of the terminal evaluation in January 2016). Pilot Section coverage was also enlarged upon request to include Dagon University Line and Thilawa Branch Line centering Toekyaungkalay Station area. These enlarged scope of the Project is the testament of relevance of the Project with the needs of the implementing agency to serve the end beneficiaries – customers - better. Given the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance.
	Relevance with the Japan's ODA Policy	Has the Project been in line with the Japanese Government' s assistance policies for Myanmar?	• Project was a direct response to "Japan's Assistance to Myanmar" (i.e. Japan's economic cooperation policy publicized on April 21, 2012) that highlights issues of operational improvement and modernization of the country's railways as a part of "infrastructure to promote economic development" and "development of infrastructure and related system necessary for the sustainable economic development." This economic cooperation policy is still current, endorsing the relevance of the Project.
	Comparative empirical and technological advantage of Japan's cooperation	Do you see Japan has clear technological and empirical advantages?	• Japan's own experiences in re-establishing the railway sector post WWII from the devastated state of significant loss of infrastructure and know-hows (such as loss of drawings) has enabled its technical cooperation to contextualize with the sectoral environment in which Myanmar is situated, who is pursuing to upgrade to mechanized system. Moreover, areas such as attention to details in equipment management and high safety standard are trademarks of Japanese railway sector, giving Japanese support an unparalleled position in the international assistance to the sector.
Effectiveness	Achievement of the Project Purpose	What is the prospect of achieving the Project Purpose by the end of the Project period?	• Refer to Section I: Project Achievements

	Evaluation Questions		Results
	Main Questions	**Sub Questions**	
Effectiveness	**<u>Project Purpose:</u>** Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	To what degree was the achievement of the Project Purpose attributable to the successful achievement of the Outputs?	• The achievement of the Project was derived by a balanced combination of Myanmar appropriate equipment and machinery brought from Japan, and the Japanese Experts who had high level of not only technical expertise but also compassionate characters. • As Project Director noted in the Terminal Evaluation interview, this Project was one of the kind MR had never experienced, and thus the results are directly attributable to the Project.
		Have the Important Assumptions for achieving the Project Purpose been fulfilled?	**<u>Important Assumptions</u>** • Administration staff members are not relocated drastically. • Technical staff members are not relocated drastically.
	Contributing factors	To what degree has each Output been produced?	• See Section 1: Project Achievement
		Have there been any other factors that contributed to the achievement of the Project Purpose?	• Donation of rails by a Japanese steel manufacture to be installed on Yangon and Mandalay line provided the Project an opportunity to check their more technology oriented skills built through the Project.
	Hindering factors to Effectiveness	Have there been any other factors that impeded the achievement of the Project Purpose?	• Equipment and materials were selected based on careful analysis of the prevailing situations/conditions, which in other words included procurement of equipment no longer in use in Japan, requiring extra time to obtain. Such process led to delay in procurement of some materials for a few months. Japanese Experts responded to the situation by modifying schedule and content of technical transfer.
Efficiency	Causality of Inputs and Outputs	Have Project activities been appropriately conducted in terms of their timing, duration, and quality to produce planned Outputs?	• The scope and type of technical transfer (i.e. mechanized track maintenance) was new to the C/P, and without the Project would not have been introduced to MR. For that matter, there was direct cause and effect relationship between Project inputs and outputs.
	Achievement of Outputs	Has the Important Assumption for achieving the Outputs been fulfilled?	**<u>Important Assumptions:</u>** • The Government support to the Myanma Railways, especially financial support is secured
	Appropriateness of Inputs by Japan	How appropriate has the assignment of Experts been in terms of the number of experts, their expertise and capabilities, and the dispatched periods and timings?	• "To implement the Project more smoothly, some JICA track experts were added to the original JICA experts" (Progress Report, p. 41) • Experts were valued by C/P as not only knowledgeable on the technical matters but also approachable.
		How appropriate has CP training in Japan and in the third countries (if applicable) been in terms of the number of participants, training contents, and the dispatched period and its timing?	• Eye-opening (Ms. Daw Khim May Than), e.g. signaling system, pension system, safety door • If not all, some track technologies are applicable in Myanmar, and thus it was enlightening experience.

	Evaluation Questions		Results
	Main Questions	Sub Questions	
Efficiency		How appropriate has the provision of equipment by the Japanese side been in terms of its quality, quantity and timing?	• With regard to some of the equipment and machinery selected for the suitability for MR were no longer readily available in the Japanese market, and required additional time to import into the country. The demand for and evaluation on the Project introduced Japanese equipment was extremely high among C/P, expressed at the time of Terminal Evaluation interviews. These comments included practicality of hand tie tampers (so much easier to handle than the huge counterpart machines traditionally available in Myanma) and prevision of vibration measuring equipment. All in all, exposure to new type of equipment through the Project put the work of C/P a level higher toward more mechanized maintenance operation.
	Appropriateness of Inputs by the Myanmar side	How appropriate has the assignment of CP been in terms of the number, placement (i.e. balance between their regular tasks and Project activities) ownership and level of participation?	• Myanmar side also made the effort in securing resources to support the Project activities. It included expenses for the Pilot Site work and materials and C/P travel.
		How appropriate has the provision of facilities and equipment by the Myanmar side been?	• Myanmar side provided temporary housing for the trainees.
		Has the budget for the Project been appropriate in scale?	• See Section 1: Project Achievement
	Cooperation with other organizations/ projects	Has there been any effective cooperation with other organizations or projects that increased the efficiency of the Project?	• See Impact Section
	Contributing or hindering factors to Efficiency	Are there any other factors that increased or decreased the efficiency of the Project?	
Impact	Prospects of achieving the Overall Goals	To what degree has the Overall Goal been achieved? **<u>Overall Goal:</u>** Service and safety level of Myanma Railways is improved.	• See Section 1: Project Achievement

	Evaluation Questions		Results
	Main Questions	Sub Questions	
Impact		Will the Overall Goal be achieved in 3 to 5 years after the completion of the Project? (Are the Overall Goal and verifiable indicators still valid?)	**Means of Verification:** Statistics on safety, Reporting of accident cause analysis and discussion of countermeasures are executed, Statistics on operation, Interview/questionnaire to clients • Given the Project has placed MR on a positive course for safety and service improvement and their commitment was evidenced during the Terminal Evaluation, there is potential for the implementing agency to achieve Overall Goal in three to five years after the Project completion, the time set for Ex-Post Evaluation as per JICA rule. However, since to what extent the pre-determined indicators will have been achieved will be measured only at that time, probability of satisfying these indicators is uncertain at this stage.
		Have the Important Assumptions for achieving the Overall Goals been fulfilled?	**Important Assumption:** Yes • Administration staff members are not relocated drastically • Technical staff members are not relocated drastically
	Other aspects	Are there any unexpected positive and negative impacts?	
Sustainability	Institutional aspect	Would relevant national/sectoral policies seem to support the Project produced Outputs after its completion?	• "The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014)," whose contents were officially adopted in January 2016 by the Government of Myanmar as the country's Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services (p. 9-27). For the connectivity MR provides both for citizens (passenger service) and business (freight service) for the country's national development, priority entrusted on to MR is expected to continue.
	Organizational aspect	Has an organizational mechanism for continuous improvement to deliver Project Outputs established?	• One positive push factor for the organization is the recent enactment of New Railway Act (January 2016). Which it will require MR to review and furnish new rules and regulations for which Project prepared manuals and documents can provide good starting references, as per the comment of MR Manager. This is one area where MR can be motivated to bring forward experiences they accumulated with the Project. • To ensure the Project will affect on the organization more broadly on its sustainability, review of organizational structure of MR to see house a unit that will oversee the safety issues across divisions. This time the Project worked Civil Division mostly, but going forward, mainstreaming safety as an organizational agenda will be make MR a more effective organization.
	Financial aspect	Have the Project concerned organizations been able to secure sufficient budget to conduct its operation and management?	• As a monopolized state-owned transport enterprise, Myanma Railways has maintained its operation under deficit as the sole critical mass transit mode for the country. This operation mode is considered to continue in the coming years, and it will be an institutional judgement and decision as to how much/less to resource the organization. However, as discussed multiple times in this report, national importance is attached to MR, and thus, its status as on-going concern is not doubted. Yet, MR always faces competition with other modes of transport, attention to and prioritization on financial soundness will definitely help the organization's footing in the society.

	Evaluation Questions		Results
	Main Questions	**Sub Questions**	
Sustainability	Technical aspect	Have core staff of the Project concerned organizations been trained sufficiently in number and knowledge to conduct its operation and management based on the annual plans developed by the Project?	• The graduates of the training have since returned to their duty stations to apply obtained techniques. This increase led the Project to provide the training to over 500 (by the time of the Terminal Evaluation in January 2016). Given the total number of civil staff at MR is around 4,000, the Project essentially affect 13% of its workforce engaged with track maintenance. • Project arranged additional equipment for the increased scope and coverage of the trainees. Allocation of such equipment to accompany the trainees is critical for them to continue the changed practice of maintenance, the one more mechanized. Thus, it will be important for the Project to complete the equipment allocation before the closure.
	Other factors that will affect the sustainability of the Project achievements	Are there any other factors that will increase or decrease the sustainability of the Project?	

Annex 5: Project Design Matrix for Terminal Evaluation (PDMe)

Project Title: The Project on Improvement of Service and Safety of Railway in the Republic of the Union of Myanmar			Period of Project: May 2013 - March 2016
Implementing Agency: Myanma Railways (MR), Ministry of Rail Transportation			
Project Site: Yangon			
Narrative Summary	**Objectively Verifiable Indicators**	**Means of Verification**	**Important Assumptions**
[Overall Goal] Service and safety level of Myanma Railways is improved	① Number of annual accidents on Yangon-Mandalay line decreases compared with the present and past records ② Journey speed on Yangon-Mandalay line increases compared with the present journey speed ③ Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation	* Statistics on safety * Statistics on operation * Statistics on operation	
[Project Purpose] Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.	① Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR. ② Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR	* Reflection on organization, management/operation rules, facilities renewal plans * Utilization, modification of administration management manuals * Actual results of maintenance execution, such as the record of maintenance	* Administration staff members are not relocated drastically * Technical staff members are not relocated drastically
[Output] 1. Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn. 2. Technical capability is improved through emergency track maintenance to improve the level of service and safety	1-1 System for collecting information of track, rolling stock, signal and communication, and operation is established. 1-2 Safety issues are listed based on the investigation and analysis of cause of accident 1-3 Service issues are listed 1-4 Service and safety improvement plan is drawn so as to tackle the issues 2-1 Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons) courses. 2-2 Working manual of emergency track maintenance is prepared. 2-3 Proper equipment and materials are procured both qualitatively and quantitatively 2-4 Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others	1-1 Related management document(s) of system for collecting information Project progress reports 1-2 Listed issues 1-3 Listed issues 1-4 Service and safety improvement plan 2-1 Record of technical transfers 2-2 Set of working manual 2-3 Inventory list of equipment and materials 2-4 Record of seminar and training	* The Government support to the Myanma Railways, especially financial support is secured

Activities	Inputs		
1-1 To conduct current situation survey regarding track, rolling stock, signal and communication, and operation, and establish system for collecting information. 1-2 To promote familiarization on the investigation and analysis method of accident cause based on the comprehensive factors of track, rolling stock, signal and communication, and operation. 1-3 To conduct the investigation and analysis mentioned above. 1-4 To provide recommendation based on above analysis on necessary technical standards to improve service and safety level. 1-5 To draw the improvement plan of railway facilities through discussion with the "Working Group for Service and Safety Improvement (tentative name)." 2-1 To draw the technology transfer plan. 2-2 To procure the necessary equipment and materials. 2-3 To conduct emergency track maintenance. 2-4 To summarize betterment point(s) obtained during emergency track maintenance operation, and to feedback to the successive measures. 2-5 To draw the working manual of emergency track maintenance. 2-6 To conduct seminars, training for technical improvement on the rail maintenance and others.	[Japanese Side] 1. Dispatch of Japanese Experts Fields of Experts (several persons) * Railway OM improvement * Technical Standards * Track Maintenance * Procurement of Equipment and Materials/Project Coordination 2. Counterpart Training in Japan * Railway Institutional Management Improvement: 11 persons x 2 weeks * Track Maintenance: 22 persons x 2 weeks 3. Equipment Necessary handy equipment of emergency track maintenance, such as Tie Tamper 4. Expense For research, travel, training, the other activities for Japanese Experts	[Myanmar Side] 1. Assignment of Counterpart * Project Director: 1 person * Project Manager: 1 person * Railway Policy/OM Improvement: 1 person * Rail Maintenance: 1 person * Procurement of Equipment and Materials: 1 person * Others: as appropriate 2. Provision of facilities for Project implementation * Project office (in the Myanma Railways, Lower Myanma Regional Office) * Working tools and furniture for Project Office * Internet connection in the Project Office 3. Joint Coordinating Committee (JCC) * Establishment of JCC 4. Expense * Local cost for personnel * Cost for office rent and equipment * Expense for the pilot project, such as gravels, sleepers, rail materials and others * Other expenses: For research, travel, training, the other activities for counterpart personnel 5. Others * Status guarantees of Japanese Experts, ID card for access into the Myanma Railways properties * Access to the necessary statistical data and related information * Other necessary local cost	[Pre-conditions] • Natural disaster does not hit the railway facility


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